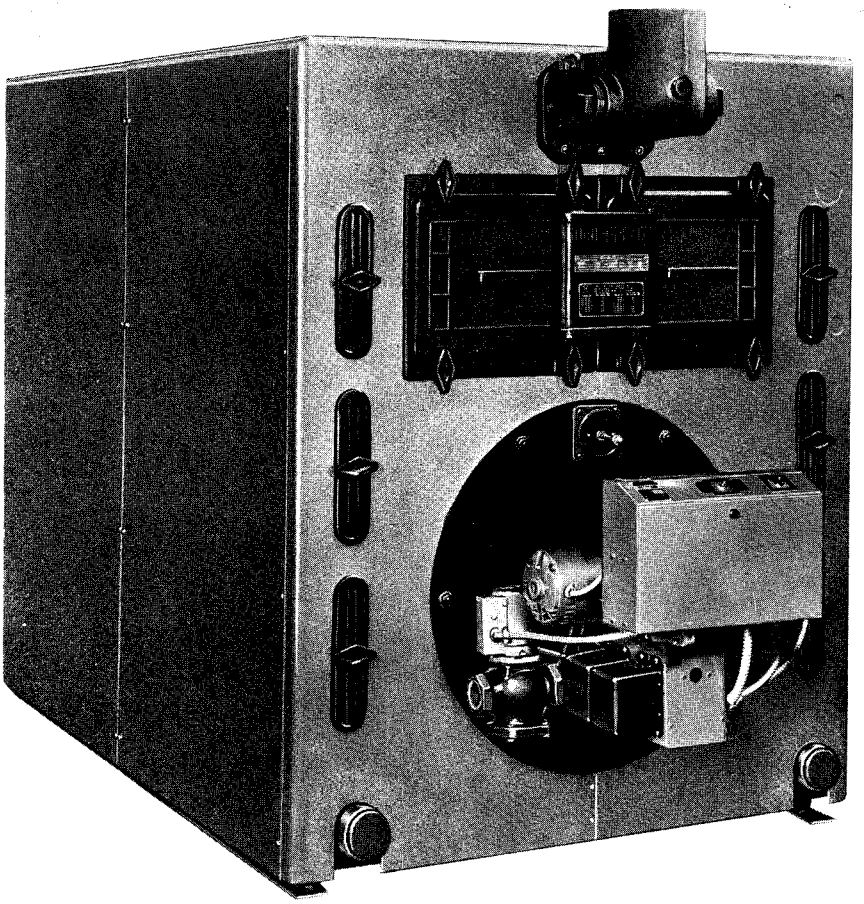
WEIL-McLAIN

WM

Boiler Manual for
No. 94 Light Oil, Heavy Oil, Gas-Light Oil, and Gas



Includes:
- **Installation**
- **Start-up**
- **Service**

READ ALL INSTRUCTIONS BEFORE INSTALLING

To the owner: Installation and service should be performed by qualified contractor.

To the installer: Leave all instructions with boiler for future reference.

Any claims for damage or shortage in shipment must be filed immediately against the transportation company by the consignee.

Part No. 550-110-275(0602)DCP

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IMPORTANT: When calling or writing about the boiler, PLEASE GIVE THE MODEL, SERIES, AND C.P. NUMBER located on the boiler rating nameplate.

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WARNING

94 BOILER IS DESIGNED FOR USE WITH WATER OR WATER-GLYCOL MIXTURE. ANY OTHER FLUIDS WILL DAMAGE BOILER. DO NOT USE PETROLEUM-BASED CLEANING OR SEALING COMPOUNDS IN BOILER.

The following defined terms are used throughout this manual to bring attention to the presence of hazards of various risk levels, or to important information concerning the life of the product.

DANGER indicates presence of a hazard which *will* cause *severe* personal injury, death or substantial property damage if ignored.

CAUTION indicates presence of a hazard which *will* or *can* cause minor personal injury or property damage if ignored.

WARNING indicates presence of a hazard which *can* cause *severe* personal injury, death or substantial property damage if ignored.

NOTICE indicates special instructions on installations, operation, or maintenance which are important but not related to personal injury hazards.

WARNING FAILURE TO FOLLOW ALL INSTRUCTIONS IN PROPER ORDER CAN CAUSE PERSONAL INJURY OR DEATH.

Section I: Pre-Installation

CODES

Installations must comply with local codes, laws, regulations and ordinances. Also, Section IV of the ASME Boiler and Pressure Vessel Code, and National Fuel Gas Code ANSI Z223.1–1984 when applicable.

AIR SUPPLY FOR COMBUSTION

WARNING Provide adequate combustion and ventilation air to assure proper combustion. DO NOT USE AN EXHAUST FAN IN THE BOILER ROOM. Incorrect burner operation will result.

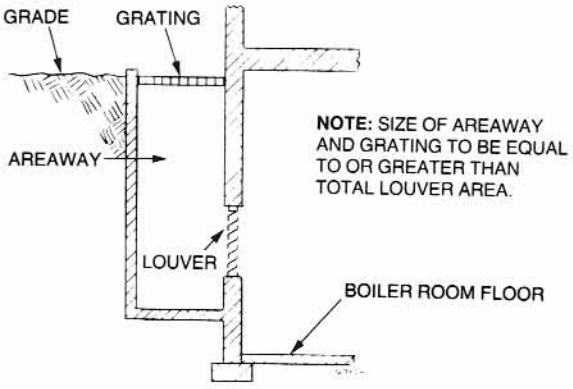
SUGGESTED COMBUSTION AIR INLETS

1. For boilers in confined rooms, two permanent openings shall be provided; one within 12 inches from the ceiling and one within 12 inches from the floor of the room. Each opening shall be at least one square inch per 1,000 BTUH boiler input. These openings shall freely connect with areas having adequate infiltration from outside.
2. When air is provided from outdoors the confined space shall be provided with two openings as outlined above. These openings shall connect directly or by ducts with outdoors or spaces (crawl or attic) that freely connect with the outdoors and shall be of the size listed below for that particular arrangement:
   (a) One square inch per 4,000 BTUH of boiler input for direct outdoor air supply through an outside wall or through vertical ducting directly to outside.
   (b) One square inch per 2,000 BTUH of boiler input for direct outdoor air through horizontal ducting.
   (c) All ducting shall be of the same size as the opening to which it is connected with minimum dimensions of no less than 3 × 3 inches or 9 total square inches of area.

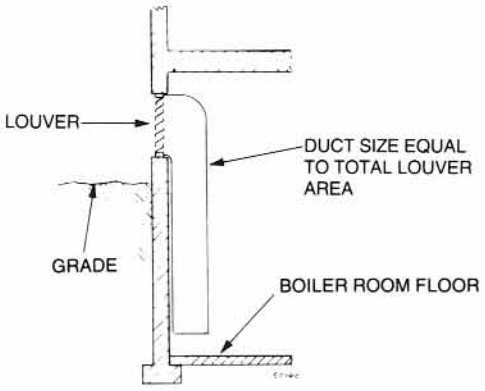
3. Compensate for louver blockage when calculating free air openings. Refer to manufacturer's instructions for size. If unknown, use:
   (a) Wood louvers—20–25% free air
   (b) Metal louvers or grilles—60–75% free air

Lock louvers open or interlock with equipment to open automatically with boiler operation.

OTHER OPENING SIZES MUST COMPLY WITH LOCAL CODES



BOILER ROOM BELOW GRADE
FIGURE 1



BOILER ROOM PARTIALLY OR COMPLETELY ABOVE GRADE
FIGURE 2

SELECT LOCATION

CONSIDER ALL CONNECTIONS TO THE BOILER BEFORE SELECTING A LOCATION.

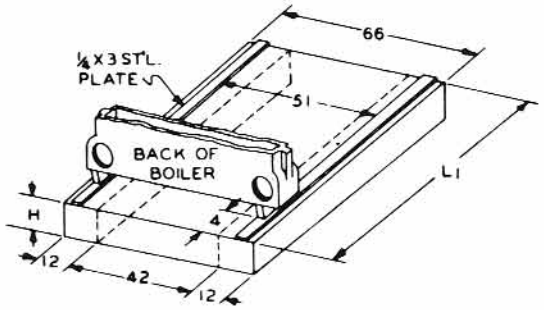
WARNING To avoid personal injury, death or property damage, keep the boiler area clear and free from combustible materials, gasoline and other flammable vapors and liquids.

MINIMUM CLEARANCES

50 inches—back, for breeching
44 inches—right side, for cleaning and tankless heater removal, if used.
Allow sufficient space on remaining sides for cleaning, servicing and burner installation. (See burner length chart, page 26 if using burner supplied by Weil-McLain.)

BOILER FOUNDATION

1. A level concrete or brick foundation is required when:
   a) there is a possibility of the floor becoming flooded.
   b) non-level conditions exist.
   c) boiler must be raised for burner installation. See Figure 3.



H = Use 2" minimum foundation height for gun type burners; Use 7" minimum foundation height for horizontal rotary or air atomizing burners. Consult burner manufacturer for required clearances if burner is not supplied by Weil-McLain.

FIGURE 3

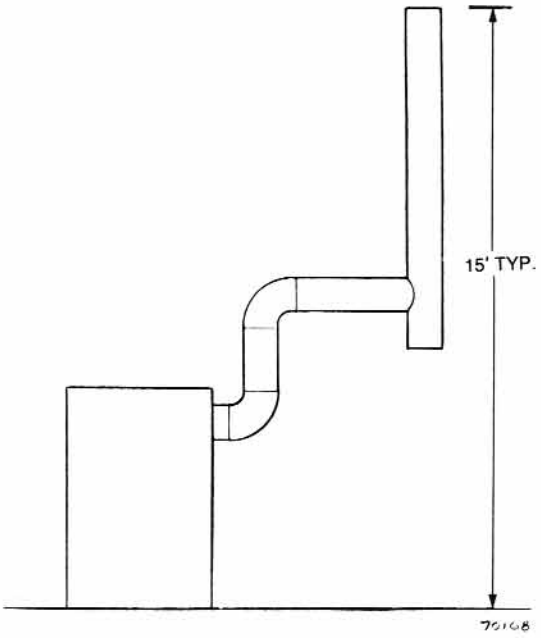
FOUNDATION SIZES (INCHES)			
BOILER NO.	L	BOILER NO.	L
894	55	1794	109
994	61	1894	115
1094	67	1994	121
1194	73	2094	127
1294	79	2194	133
1394	85	2294	139
1494	91	2394	145
1594	97	2494	151
1694	103	2594	157

CHIMNEY OR VENT

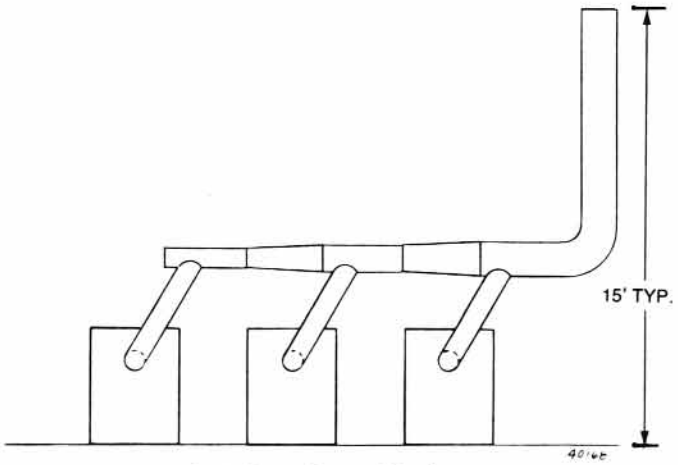
94 forced draft boilers operate with positive overfire pressure. Breeching damper must be adjusted during burner start up to 0.1" W.C. positive pressure.

CAUTION Avoid long horizontal breechings, excessive numbers of elbows or tees, or other obstructions restricting flow of combustion gases.

See page 25 for minimum breeching diameter. Construct metal vent—select material and thickness in compliance with local codes. Refer to ASHRAE Guide for chimney and breeching calculations.



Stub Vent—Forced Draft
Single Boiler
FIGURE 4



Stub Vent-Forced Draft
Multiple Boiler
FIGURE 5

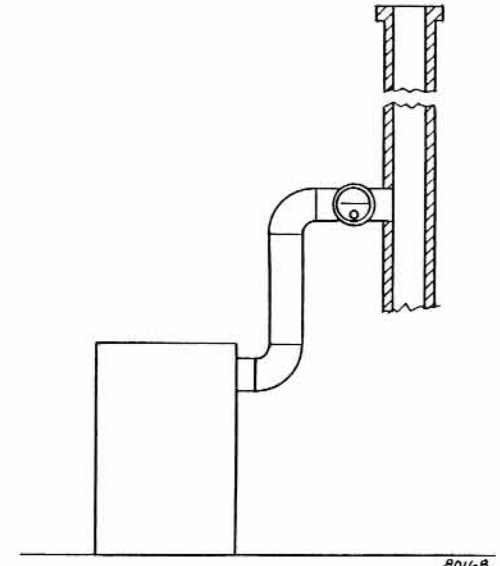
Two types of vent systems may be used:

FORCED DRAFT

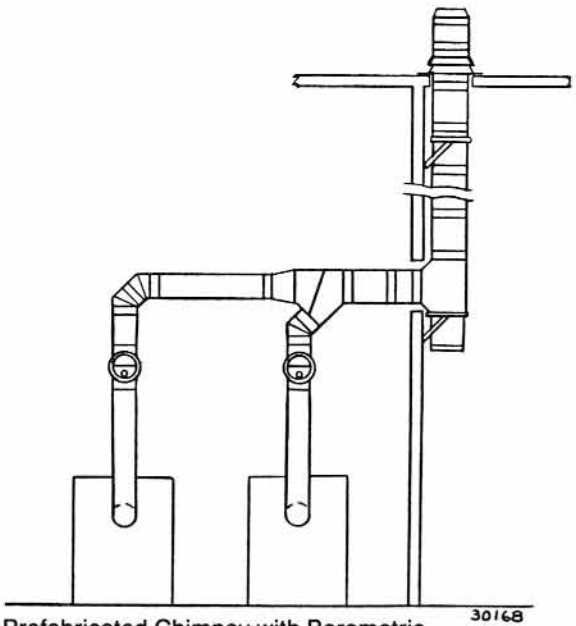
Boiler, breech, and stub vent operate at positive pressure. Entire system must be gas tight to prevent leaks. Stub vent height must be limited to prevent negative draft. (See Figures 4 and 5.) Barometric control cannot be installed with stub vent.

BALANCED DRAFT

Boiler operates with positive pressure overfire. Chimney provides negative pressure that must be balanced with a barometric draft control. (See Figures 6 and 7.)



Conventional Chimney with Barometric
Balanced Draft
FIGURE 6



Prefabricated Chimney with Barometric
Balanced Draft
FIGURE 7

Section II: Assembled Sections or Packaged Boilers

1. Move boiler:
   a) Using crane—cable or sling must be capable of safely handling weight. Use 4 cables or slings per boiler. See table. Hook ends of slings on boiler lifting lugs and other ends to eye of crane.
   b) Using hoist—raise boiler onto pipe rollers.

CAUTION Do not raise or move boiler with jack or forklift. Sections could shift, causing leaks.

2. Place boiler in final position. Front of skid channels must line up with foundation, if used.
3. Level boiler. Shim under skid channels if necessary.
4. Remove plastic wrap or caps.
5. Go to "Hydrostatic Pressure Test," page 10.

LIFTING WEIGHTS AND SLING LENGTHS

Boiler Number	Approximate Lifting Weight Pounds	*Minimum Sling Length
894	8,600	3' 6"
994	9,500	3' 6"
1094	10,300	4' 0"
1194	11,200	4' 6"
1294	12,000	5' 0"
1394	12,800	5' 0"
1494	13,700	5' 0"
1594	14,500	5' 0"
1694	15,400	5' 0"
1794	16,200	5' 0"
1894	17,100	5' 0"
1994	17,900	5' 6"
2094	18,700	5' 6"
2194	19,800	7' 6"
2294	20,600	7' 6"
2394	21,500	7' 6"
2494	22,400	8' 0"
2594	23,200	8' 0"

* Minimum sling length from crane hook to boiler lifting lugs.

Section III: Site-Assembly

1. Prepare back section:
   a) Locate section on steel strips. If foundation is not used, place strips 51" apart on floor.
   b) Block under flueway outlet to hold section upright in plumb position. Blocking can be removed after several sections have been erected.

WARNING Sections are top heavy and will not stand individually without support.

CAUTION First section must be plumb. Failure to plumb section will cause incomplete sealing of section.

2. Apply 1/8" continuous bead of sealing rope adhesive in sealing grooves (see Figure 8).
3. Place 5/8" rope in grooves. Around corner and curve, grasp at 1" intervals and push together. **Do not stretch**. Cut rope as each flueway and section perimeter is completed (see Figure 8).

NOTICE DO NOT PRECUT ROPE. Gas tight seal must be maintained.

4. Remove any grit from port openings with clean rag.

CAUTION DO NOT USE any cleaner containing petroleum-based distallate (oil). Elastomer ring failure will occur.

5. Place 9" and 6" elastomer sealing rings in appropriate port openings. See Figure 8.

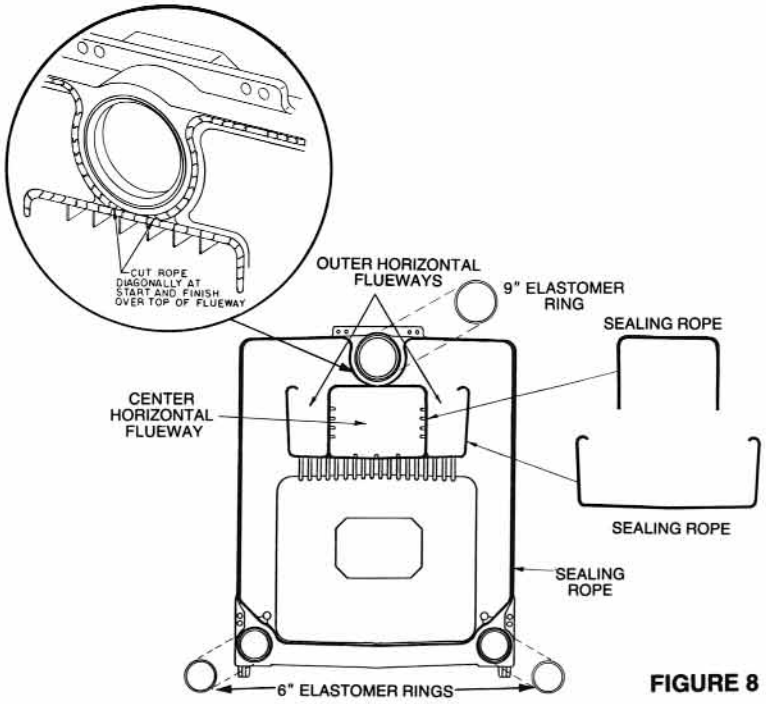


FIGURE 8

6. Apply continuous small bead of silicone sealant around entire **outside** of rings to prevent contact with unburned oil vapors. Refer to Figure 9. **DO NOT APPLY UNDER RING.**

CAUTION Contact with unburned oil vapors can cause elastomer ring failure.

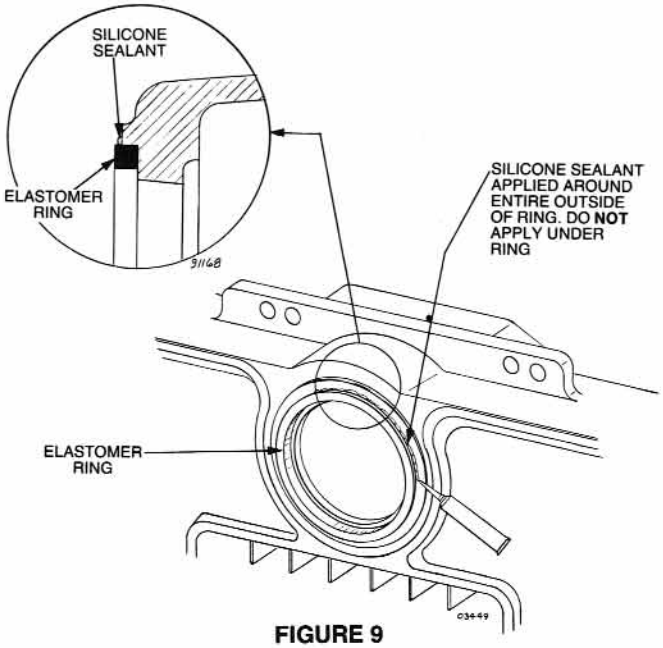

SILICONE SEALANT
ELASTOMER RING
SILICONE SEALANT APPLIED AROUND ENTIRE OUTSIDE OF RING. DO **NOT** APPLY UNDER RING
ELASTOMER RING

FIGURE 9

7. Prepare intermediate section.
   a) Discard 3/8" shipping tie rods.
   b) Remove grit from port machined surfaces.

CAUTION DO NOT USE any cleaner containing petroleum-based distillates (oil). Elastomer ring failure will occur.

   c) Position intermediate section against section in back of it so aligning lugs and sockets fit together. See Figure 10.

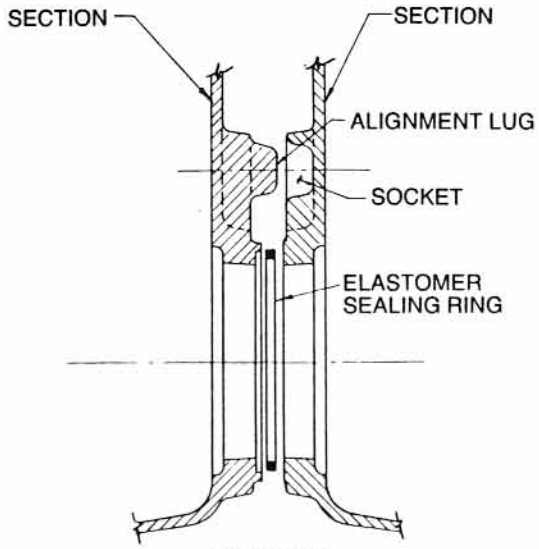


FIGURE 10

8. DRAW SECTIONS TOGETHER UNTIL METAL-TO-METAL CONTACT IS MADE AROUND MACHINED PORT OPENINGS (SEE FIGURE 11):
   a) Oil threads on four 5/8" × 11" draw rods. Install washer and nut on end to be tightened. Use nut only on other end.
   b) Uniformly draw sections together, starting at washer/nut end.
   c) Draw rods should be torqued to a range of 100–120 ft./lbs. Do not back off draw rods.
   d) Metal-to-metal contact will be achieved around port openings. See Figure 11. If a gap does exist, it should be no greater than .032". Check with feeler gauge.
   e. If for any reason, gap around port opening EXCEEDS .032", check for rope extending from rope grooves, dirt on port openings or sockets, or misaligned lugs. If corrections are made and gap still exists, contact your Weil-McLain distributor or sales office before continuing installation.

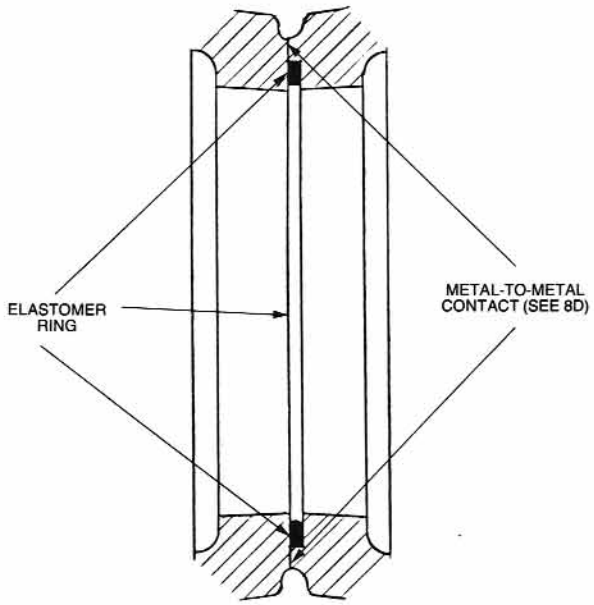


FIGURE 11

9 Prepare drawn section by following steps 2–6.

10. Follow steps 7–9 for remaining intermediates and front section:
   a) Use 5/8" × 10" draw rods between any two intermediates.
   b) When used, "TI" and "SI" sections must be installed as shown in tables, p. 8.

CAUTION Check sealing rope of each section before proceeding to next section. Boiler must be sealed gas-tight.

11. Remove any grit from threads inside tapped holes.

CAUTION DO NOT USE any cleaner containing petroleum-based distillate (oil). Elastomer ring failure will occur.

TI SECTION ARRANGEMENT TABLE WITH INDIRECT WATER HEATERS
(Counting from Front to Back)

1 HEATER		2 HEATERS	3 HEATERS	4 HEATERS	5 HEATERS	6 HEATERS	7 HEATERS	8 HEATERS
Boiler Number	Location of TI Section With Heater At Right Side	Locations of TI Sections With Heaters At Right Side	Locations of TI Sections With Heaters At Right Side	Locations of TI Sections With Heaters At Right Side	Locations of TI Sections With Heaters At Right Side	Locations of TI Sections With Heaters At Right Side	Locations of TI Sections With Heaters At Right Side	Locations of TI Sections With Heaters At Right Side
894	4	2,4	2,4,6	—	—	—	—	—
994	4	2,4	4,6,8	2,4,6,8	—	—	—	—
1094	7	7,9	4,7,9	2,4,7,9	—	—	—	—
1194	8	8,10	4,8,10	2,4,8,10	—	—	—	—
1294	9	9,11	4,9,11	2,4,9,11	2,4,6,9,11	—	—	—
1394	9	9,11	4,9,11	2,4,9,11	2,4,6,9,11	—	—	—
1494	9	9,11	9,11,13	2,4,9,11	2,4,9,11,13	2,4,6,9,11,13	—	—
1594	10	10,12	10,12,14	2,4,10,12	2,4,10,12,14	2,4,6,10,12,14	—	—
1694	11	11,13	11,13,15	2,4,11,13	2,4,11,13,15	4,6,8,11,13,15	2,4,6,8,11,13,15	—
1794	11	11,13	11,13,15	2,4,11,13	2,4,11,13,15	4,6,8,11,13,15	2,4,6,8,11,13,15	—
1894	11	11,13	13,15,17	11,13,15,17	4,11,13,15,17	2,4,11,13,15,17	4,6,8,11,13,15,17	2,4,6,8,11,13,15,17
1994	14	14,16	14,16,18	9,11,14,16	9,11,14,16,18	4,9,11,14,16,18	2,4,9,11,14,16,18	2,4,6,9,11,14,16,18
2094	15	15,17	15,17,19	9,11,15,17	9,11,15,17,19	4,9,11,15,17,19	2,4,9,11,15,17,19	2,4,6,9,11,15,17,19
2194S	20	13,20	11,13,20	9,11,13,20	2,9,11,13,20	—	—	—
2294S	21	13,21	11,13,21	9,11,13,21	2,9,11,13,21	—	—	—
2394S	22	15,22	13,15,22	11,13,15,22	9,11,13,15,22	2,9,11,13,15,22	—	—
2494S	17	17,23	13,17,23	11,13,17,23	9,11,13,17,23	2,9,11,13,17,23	—	—
2594S	18	18,24	15,18,24	13,15,18,24	11,13,15,18,24	9,11,13,15,18,24	2,9,11,13,15,18,24	—
2194W	16	16,18	16,18,20	13,16,18,20	11,13,16,18,20	9,11,13,16,18,20	6,9,11,13,16,18,20	—
2294W	17	17,19	17,19,21	13,17,19,21	11,13,17,19,21	9,11,13,17,19,21	6,9,11,13,17,19,21	—
2394W	18	18,20	18,20,22	15,18,20,22	13,15,18,20,22	11,13,15,18,20,22	9,11,13,15,18,20,22	6,9,11,13,15,18,20,22
2494W	17	17,19	19,21,23	17,19,21,23	13,17,19,21,23	11,13,17,19,21,23	9,11,13,17,19,21,23	6,9,11,13,17,19,21,23
2594W	18	18,20	20,22,24	18,20,22,24	15,18,20,22,24	13,15,18,20,22,24	11,13,15,18,20,22,24	9,11,13,15,18,20,22,24

If the boiler was ordered with indirect water heater(s), the heater(s) must be located on the right hand side of the boiler. It iis important to position the TI section(s) (where used) in the exact location in the boiler section assembly as shown above so the heater knockout openings in the jacket side panels will accommodate the heater(s). If the TI section(s) and internal water heaters are not positioned in the boiler section assembly as shown above, the installer must cut openings(s) in the jacket side panels(s) to accommodate the heater(s).

LOCATIONS OF SI SECTIONS
COUNTING FROM FRONT TO BACK

	STEAM	WATER
Boiler No.	Locations of SI Sections	Locations of SI Sections
2194	4, 6, 16 & 18	2 & 4
2294	4, 6, 17 & 19	2 & 4
2394	4, 6, 18 & 20	2 & 4
2494	4, 6, 19 & 21	2 & 4
2594	4, 6, 20 & 22	2 & 4

12. To install burner mounting plate in front section (for H-94 boilers, if plate was not ordered, one must be made according to burner requirements):
    a) Thread two nuts on rounded end of 1/2" × 4 1/4" stud, locking them together. Screw flat end of stud in one of six holes around opening.
    b) Remove nuts from stud and save.
    c) Repeat for remaining five studs.
    d) Apply 1/8" continuous bead of rope adhesive in groove around opening.
    e) Postion 1/2" sealing rope in groove. Overlap ends about 2".
    f) Install burner mounting plate with observation port at top of plate. Use 1/2" washers and nuts.
13. Install front observation port assembly over half-moon on burner mounting plate:
    a) Apply 1/8" continuous bead of rope adhesive in groove on assembly.
    b) Position 3/8" sealing rope in groove, overlapping ends at least 1".
    c) Secure assembly to plate. Use 1/4" × 3/4" flat head machine screws.
14. If cleanout and inspection tappings were ordered, use 1 1/2" brass countersunk plugs to plug openings.
15. If using "TI" sections, install tankless or storage heaters and gaskets, or heater plates and gaskets. Use 3/8" cap screws.
16. For steam boilers:
    a) 894—
        1) Secure supply elbow and outlet gasket to front section and supply outlet cover plate and gasket to back section. Use 5/8" × 3" studs, nuts and washers. Thread flat end of stud into section.
        2) Secure 6" return opening counter flange and gasket to back section. Use 3/4" × 2" cap screws and washers.
    b) 994–2094—
        1) Secure supply elbows and outlet gaskets to front and back sections. Use 5/8" × 3" studs, nuts and washers. Thread flat end of stud into section.
        2) Secure 6" return opening counter flange and gasket to back section. Use 3/4" × 2" cap screws and washers.
    c) 2194–2594—
        1) Secure outlet cover plates and gaskets to front and back sections. 3/4" tappings in plates should be at top. Use 5/8" × 3" studs, nuts and washers.
        2) Secure 10" supply outlets and gaskets on top of "SI" sections. Supply outlet installed close to boiler front should have 1 1/4" tapping facing front. Use 5/8" × 1 3/4" hex hd. cap screws and washers.
        3) Secure 6" N.P.T. return opening counter flange and gasket to back section. Use 3/4" × 2" hex hd. cap screws and washers.
17. For water boilers:
    a) 894–1294—
        1) Secure supply elbow and gasket to front section and supply outlet cover plate and gasket to back section. Use 5/8" × 3" studs, nuts, and washers. Thread flat end of stud into section.
        2) Secure 6" return opening counter flange and gasket to back section. Use 3/4" × 2" cap screws and washers.
    b) 1394–2094—
        1) Secure supply elbow and gasket to front section and supply outlet cover plate and gasket to back section. Use 5/8" × 3" studs, nuts, and washers. Thread flat end of stud into section.
        2) Secure 8" pipe with standard 8" flange (not furnished) and gasket (furnished) to back section. Use 3/4" × 2" cap screws and washers (furnished).
    c) 2194–2594—
        1) Secure outlet cover plate with 3 holes (3/4" tapping on top) and gasket to front section and outlet cover plate with 2 holes and gasket to back section. Use 5/8" × 3" studs, washers, and nuts. Thread flat end of stud into section.
        2) Secure 10" supply outlets and gaskets on top of "SI" sections. Supply outlet installed close to boiler front should have 1 1/4" tapping facing front. Use 5/8" × 1 3/4" hex hd. cap screws and washers.
        3) Secure 10" flanged return adapter and gasket to back section. Use 3/4" × 2" hex hd. cap screws and washers.

Section IV: Hydrostatic Pressure Test

1. Refer to Control Tapping Table and Figure 12 to install:
   a) water pressure gauge—for test only.
   b) air vent in upper tapping.
2. Install 3" close nipples and caps in washout tappings in front section.
3. Install drain valve (not furnished) in one washout tapping and 2" × 2½" nipple and cap in other washout tappings in back section.
4. Plug or use blind flanges on remaining tappings.
5. Fill boiler. Vent all air. Test at 1½ times working pressure for more than 10 minutes.

WARNING DO NOT LEAVE BOILER UNATTENDED. Cold water fill could expand and cause excess pressure.

6. Check for maintained gauge pressure.
7. Check for leaks. Repair if found.

CAUTION Repair leaks at once. Damage to boiler can result. NEVER use petroleum-based stop leak compounds. Leakage between sections will occur.

8. Drain boiler and remove plugs from tappings used for controls and accessories.

CONTROL TAPPING TABLE

			STEAM		WATER	
Identification	**Location**	**Size**	**Description**	**Location**	**Description**	**Location**
J_1†	Front Section	½"	See J_1 and J_5	—	High-Limit Control■ or Pressure Gauge	AL
J_2†	Front Section	½"	Plug	NA	Plug	NA
J_5†	Front Section	½"	See J_1 and J_5	—	Plug	NA
J_1† & J_5†	Front Section	½"	Gauge Glass	DL	—	—
M_3	Front Section	1"	—	—	Probe Type Low-Water Cutoff	DL
M_1† & M_2†	Front Section	1"	Low-Water Cutoff; or Low-Water Cutoff & Pump Control; or Low-Water Cutoff & Feeder Combinaton	DL	Low-Water Cutoff; or Low-Water Cutoff & Feeder Combination	DL
M_3† & M_4†	Front Section	1"	Low-Water Cutoff; or Low-Water Cutoff & Pump Control; or Low-Water Cutoff & Feeder Combinaton	AL	Low-Water Cutoff; or Low-Water Cutoff & Feeder Combination	AL
P_1*	Front Supply Elbow	3"	Skim Tapping	AL	High-Limit or Dual Operating and Limit Control■	DL
P_2□	Back Supply Elbow	3"	•Steam Relief Valve (994 through 2094 boilers only)	DL	—	—
R_1*	Front Supply Elbow	4"	Skim Tapping	DL	Plug	NA
R_2□	Back Supply Elbow	4"	•Steam Relief Valve (1294 through 2094 boilers only)	DL	—	—
S_1*	Front Supply Elbow	¾"	Steam Pressure Gauge and/or Pressure Limit & Operating Controls	DL	Combination Pressure-Temperature-Altitude Gauge; or Temperature Gauge	DL
S_2□	Back Supply Elbow	¾"	Pressure Limit and Operating Control (994–2094 only)	AL	—	—
T_1†*	Front Supply Elbow	1¼"	Pressure Limit and Operating Control	AL	Piping to Compression Tank or Pressure Gauge (894–2094)	DL
T_2†*	Front Supply Elbow	1¼"	Pressure Limit & Operating Controls (and Firing Rate Control where used)	DL	Piping to Compression Tank or Pressure Gauge (894–2094)	DL
T_3†□	Back Supply Elbow	1¼"	•Pressure Limit & Operating Controls (Steam Safety Valve 1094 & 1194 steam boilers only)	AL	—	—
T_4†□						
U_1▲	Back Outlet Cover Plate	2"	•Steam Relief Valve (894 steam boiler only)	DL	•Pressure Relief Valve (894 through 2594)	DL
U_2▲	Back Outlet Cover Plate	2"	Plug (894 steam boiler only)	NA	•Pressure Relief Valve (2094 through 2594); Plug (894 through 1994)	DL
V_1⌀	Front Outlet Cover Plate	4"	•Steam Relief Valve and Skim Tapping	DL	Firing Rate Control	DL
W_1⌀	Front Outlet Cover Plate	¾"	Pressure Limit Control, Pressure Operating Control■, & Firing Rate Control	DL	■Combination High-Limit and Low-Limit Control; or High-Limit Control	DL
W_2⌀	Front Outlet Cover Plate	¾"	Steam Pressure Gauge	DL	Combination Pressure-Temperature-Altitude Gauge; or Temperature Gauge	DL
V_2▼	Back Outlet Cover Plate	4"	•Steam Relief Valve and Skim Tapping	DL	—	—
W_3▼	Back Outlet Cover Plate	¾"	Pressure Limit and Operating Controls■	AL	—	—
W_4▼						
X_1†⌀	10" Front Supply Outlet	1¼"	Pressure Gauge	AL	Pressure Gauge	AL
X_2†⌀	10" Front Supply Outlet	1¼"	Plug	NA	Piping to Compression Tank (2194–2594)	DL
X_3†⌀	10" Back Supply Outlet	1¼"	Pressure Gauge	AL	—	—
X_4▼	10" Back Supply Outlet	1¼"	Plug	NA	—	—
Y_1†	Front Section	⅜"	Try Cock	—	Plug	—
Y_2†	Front Section	⅜"	Try Cock	—	Plug	—

DL—Most Desired Location **AL—Alternate Location** **NA—Not Allowed**

Notes: 1. Try Cock Tappings are standard for front section and optional for back section.

† Do not use these tappings for operating control location on water boilers.

* Furnished with 894 through 2094 steam and water boilers only.

■ When internal water heater(s) are installed in boiler, use temperature control tapping in heater plate for additional operating (low-limit) control.

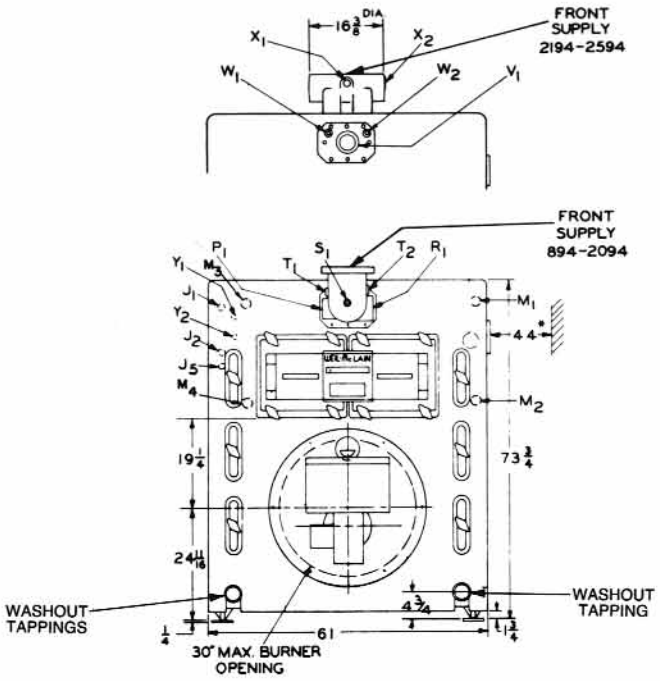
□ Furnished with 994 through 2094 steam boilers only.

▲ Furnished with 894 steam boiler only, and 894 through 2594 water boilers.

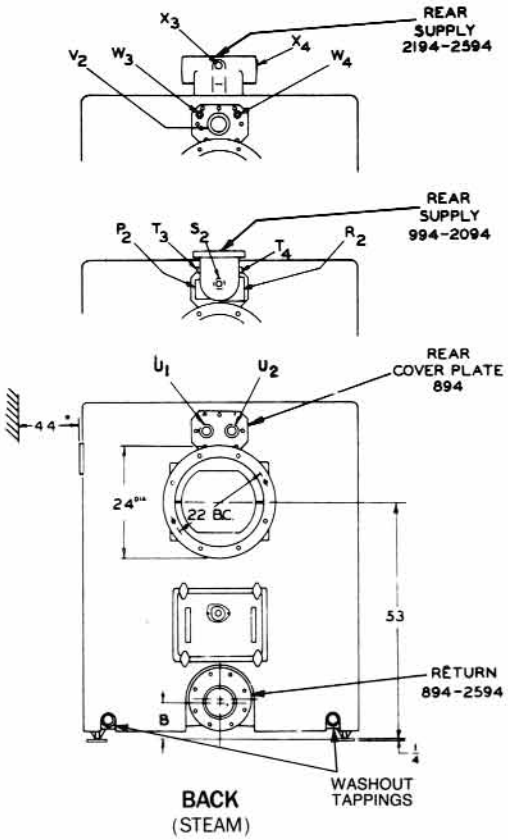
⌀ Furnished with 2194 through 2594 steam and water boilers only.

▼ Furnished with 2194 through 2594 steam boilers only.

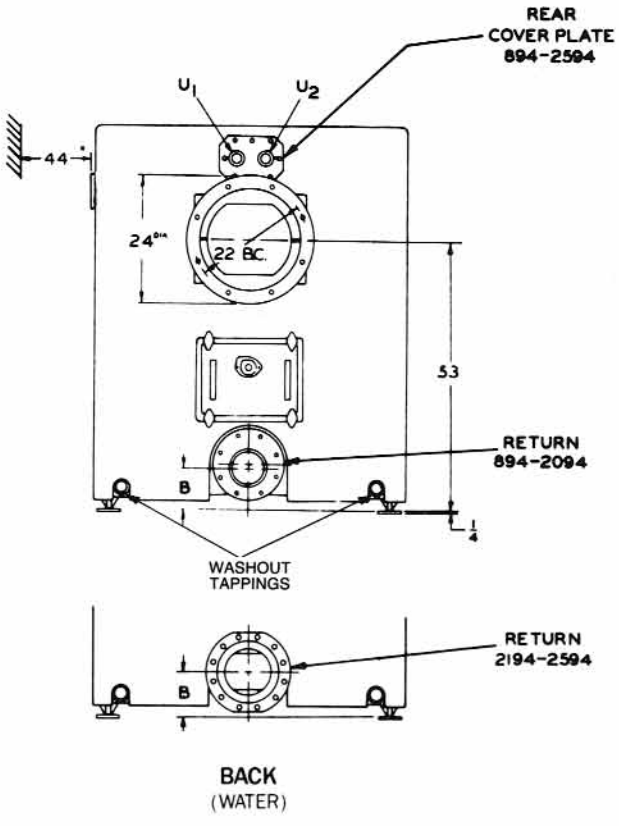
• For 894 and 994 steam boilers, one Steam Relief Valve is furnished; 1094 through 2594 steam boilers are furnished with two Steam Relief Valves.
For 894 through 1994 water boilers, one Pressure Relief Valve is furnished; 2094 through 2594 water boilers are furnished with two Pressure Relief Valves.



FRONT



BACK
(STEAM)

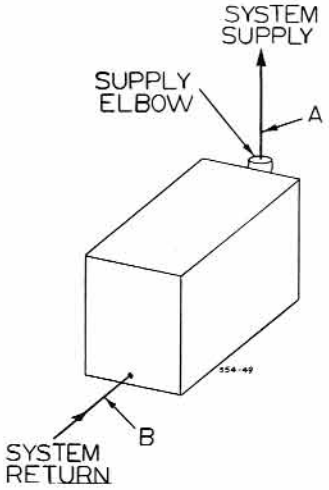


BACK
(WATER)

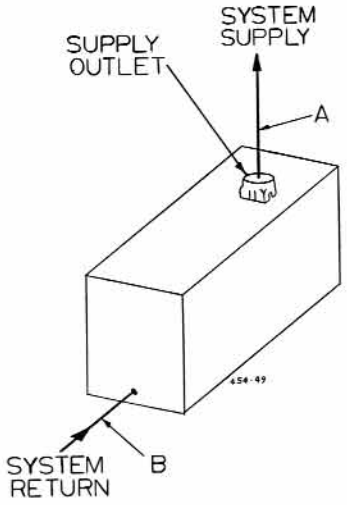
FIGURE 12

WATER BOILERS

1. It is recommended that system supply and return piping be installed and piping connections be attached to the boiler before erecting jacket or installing controls.
2. Improper piping systems and/or undersized piping can contribute to erratic boiler operation and possible boiler damage. Install as shown below.



894–2094 WATER BOILERS
FIGURE 13



2194–2594 WATER BOILERS
FIGURE 14

3. Reverse water flow through boiler must not be used.
4. Connect supply and return piping:
   a) Size according to Tables 1 or 2.

TABLE I
FOR KNOWN FLOW RATES*

WATER FLOW RATE	SUPPLY PIPE SIZE A	RETURN PIPE SIZE B
To 77 GPM	3"	3"
78 to 132 GPM	4"	4"
133 to 208 GPM	5"	5"
209 to 300GPM	6"	6"
301 to 520 GPM	8"	8"
521 to 820 GPM	10"	10"

*High temperature rise through boiler is permissible when boiler piping connections are sized using above Table 1. INTERMITTENT flow at HIGH velocities may damage boiler.

TABLE II
FOR UNKNOWN FLOW RATES**

BOILER NUMBER	SUPPLY PIPE SIZE A	RETURN PIPE SIZE B
894	5"	5"
994 to 1294	6"	6"
1394 to 2094	8"	8"
2194 to 2594	10"	10"

**All piping sizes are based upon 20° F. temperature rise through the boiler. For use of other temperature rises through the boiler (i.e. higher flow rates) determine the flow rate and use Table I for pipe sizes. Do not use flow rates in excess of 520 GPM thru 894–2094 or 820 GPM thru 2194–2594.

   b) Connect circulator to system supply piping to pump water away from boiler.
   c) For return piping, use full diameter pipe for 10 times that diameter before making any reduction. For example, an 8" return should not be reduced any closer to boiler return tapping than 80".
   d) Install system blow-off (drain) valve in lowest part of return piping close to boiler or in washout tapping. Size per ASME chart below.

MINIMUM BLOW OFF (DRAIN) VALVE SIZE

Boiler Size	Valve Size (in.)
894–994	1¼
1094–2194	1½
2294–2594	2

5. When three-way valves are used for temperature modulation, install slow-opening valves to minimize the potential of boiler thermal shock.
6. Multiple boilers, see Figure 16.

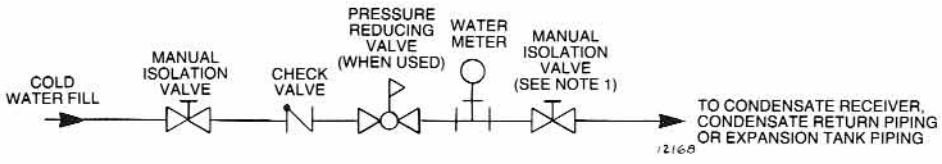
7. Expansion tank piping:
   a) 894–1294 boilers
      1) Closed type—connect to 1¼" tapping "T_1" or "T_2" (refer to table, p.10). Use 1¼" N.P.T. piping. Any horizontal piping must pitch up toward tank at least 1" per 5 feet of piping.
      2) Closed diaphragm pre-pressurized type—locate anywhere in system, preferably near boiler.

NOTICE Automatic air vent must be installed in "T_1" or "T_2" tapping when closed diaphragm pre-pressurized type is used.

   b) 2294–2594 boilers
      1) Closed type—connect to 1¼" tapping "X_2" (refer to table, p. 10). Use 1¼" N.P.T. Piping. Any horizontal piping must pitch up toward tank at least 1" per 5 feet of piping.
      2) Closed diaphragm pre-pressurized type—locate anywhere in system, preferably near boiler.

NOTICE Automatic air vent must be installed in "X_2" tapping when closed diaphragm pre-pressurized type is used.

   c) Connect cold water fill to expansion tank piping. See Figure 15. Also shown are recommended valves and water meter. Water meter will detect need for make-up water, indicating leaks in system.


COLD WATER FILL
MANUAL ISOLATION VALVE
CHECK VALVE
PRESSURE REDUCING VALVE (WHEN USED)
WATER METER
MANUAL ISOLATION VALVE (SEE NOTE 1)
TO CONDENSATE RECEIVER, CONDENSATE RETURN PIPING OR EXPANSION TANK PIPING
12168

NOTE: 1. Use globe valve when manual adjustment of water flow is required.

MAKE-UP WATER PIPING
STEAM OR WATER BOILERS
FIGURE 15

PRIMARY-SECONDARY PIPING

Weil-McLain recommends piping as shown. For single boilers, pipe as shown for one unit.

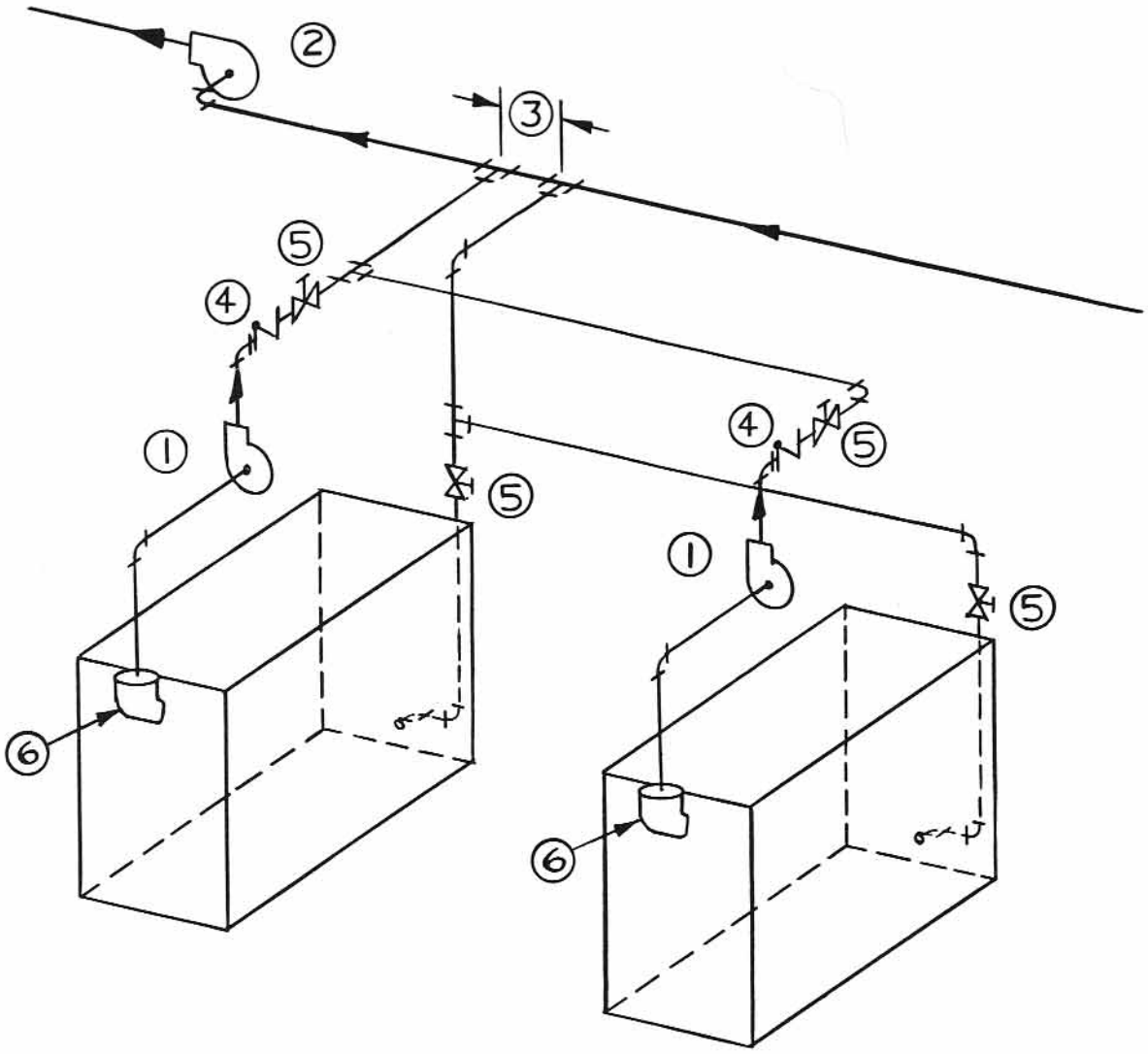


FIGURE 16

(1) Size secondary boiler pump GPM based upon following formulas:

230°F – RETURN WATER TEMPERATURE = TEMPERATURE RISE THRU BOILER

$$\frac{\text{GROSS OUTPUT IN BTU/HR.}}{\text{TEMP. RISE IN °F} \times 500} = \text{GPM}$$

Calculate only secondary piping circuit resistance. Boiler resistance will be approx. equal to three 90° elbows of secondary pipe size.
Operate each boiler and its secondary pump from EMCS system. Do not maintain boiler at predetermined water temperature.

(2) Primary pump GPM and head calculation should not include secondary boiler circuits. Primary pump can operate continuously during heating season.

(3) Space as close as practical.

(4) Swing check valve.

(5) Hand valve.

(6) Supply elbow shown for 894–2094. Use top supply outlet for 2194–2594.

Expansion tank(s), relief valves and other accessories are required but not shown.

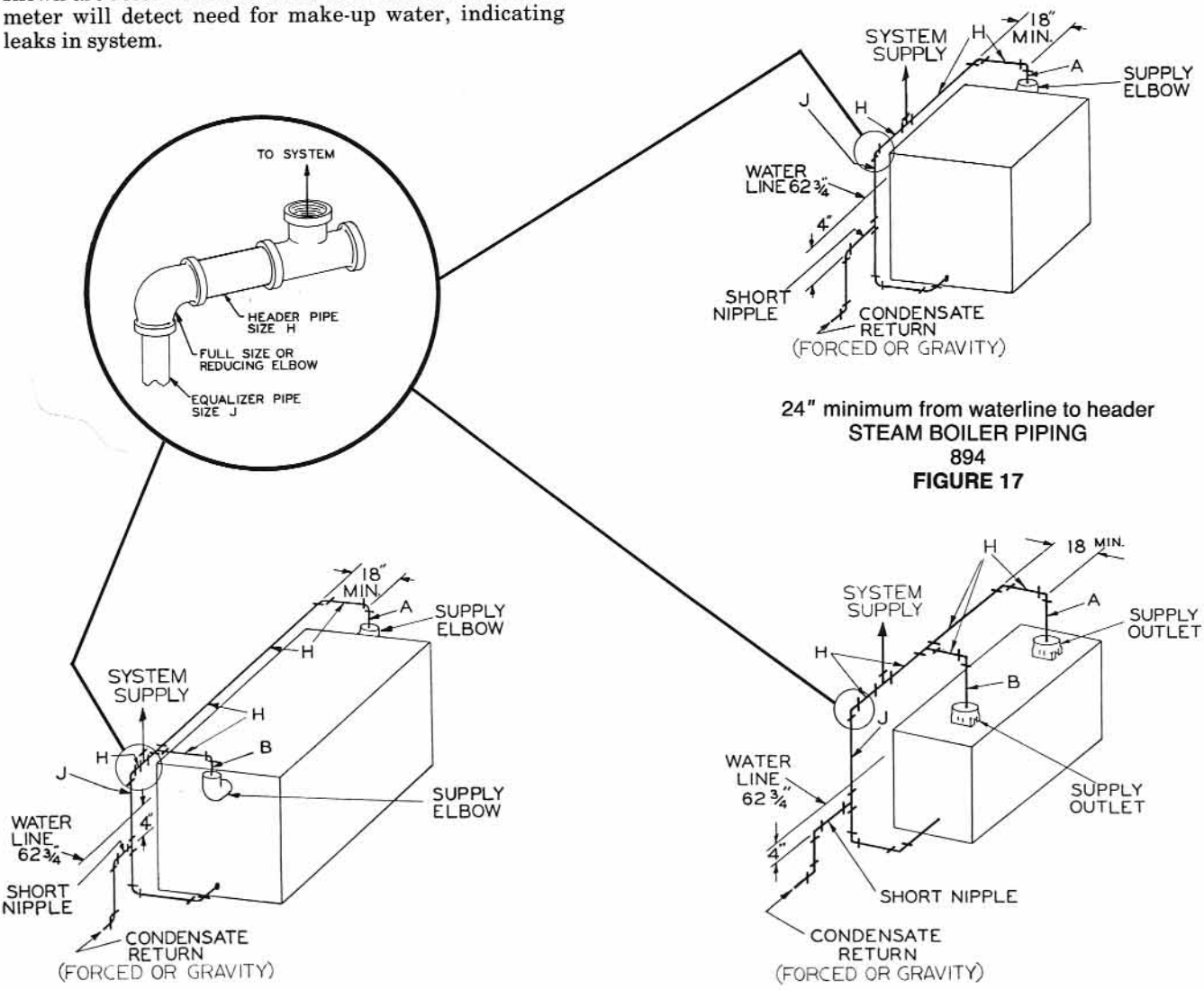
STEAM BOILERS

1. Improper piping systems and/or undersized piping can contribute to erratic boiler operation and possible boiler damage. The piping system must be installed as illustrated using pipe sizes shown. Consult Weil-McLain Distributor or Sales Office before installing alternate piping.
2. A Hartford Loop piping arrangement and wet return are required.
3. Maintain 24″ minimum from waterline to header.
4. Receiver with float switch energizing feed pump is not recommended.
5. Install system blow off valve in lowest part of return piping close to boiler. Size to ASME code requirements. See table on page 12.
6. Install cold water fill piping as shown in Figure 15. Also shown are recommended valves and water meter. Water meter will detect need for make-up water, indicating leaks in system.

STEAM BOILER PIPE SIZES

Fig. No.	Boiler Size	Riser Pipe Size A	Riser Pipe Size B	Header* H	Equalizer J
17	894	8"		8"	4"
18	994–1594	8"	8"	8"	4"
18	1694–2094	8"	8"	10"	4"
19	2194–2594	10"	10"	12"	4"

*24" Minimum from waterline to header.



24" minimum from waterline to header
STEAM BOILER PIPING
894
FIGURE 17

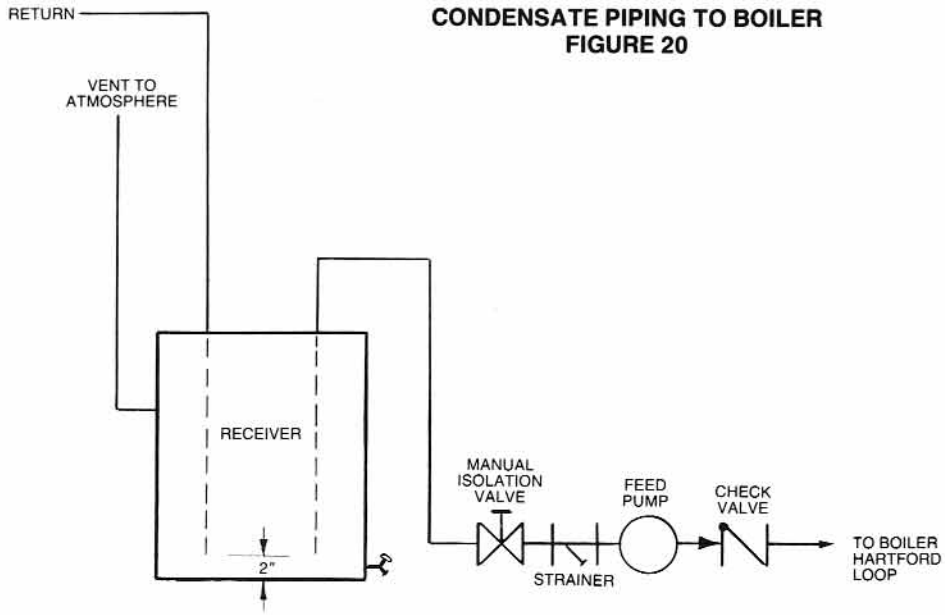
24" minimum from waterline to header
STEAM BOILER PIPING
994-2094
FIGURE 18

24" minimum from waterline to header
STEAM BOILER PIPING
2194–2594
FIGURE 19

NOTICE

Satisfactory operation of any steam heating system depends upon adequate return of condensate to maintain steady water level. Avoid adding excessive amounts of raw make-up water. Where condensate return is not adequate, a low water cut-off and pump control, condensate receiver, and condensate boiler feed pump should be installed. Refer to Figure 20 for piping, Figure 21 for sizing.

CONDENSATE PIPING TO BOILER
FIGURE 20



CONDENSATE RECEIVER CAPACITY

Boiler No.	Gross Output Pounds of Steam Per Hour	Gallons of Condensate Per Hour	Minimum Condensate Receiver Capacity				Recommended Condensate Feed Pump Capacity G.P.M. at 15 PSI
			15 Min. Boiler Operation	30 Min. Boiler Operation	45 Min. Boiler Operation	60 Min. Operation Boiler	
894	2,028	244	74	148	222	296	8.0
994	2,320	279	84	168	252	336	9.0
1094	2,612	314	95	190	285	380	10.5
1194	2,904	349	105	210	315	420	12.0
1294	3,190	383	115	230	345	460	13.0
1394	3,480	418	126	252	378	504	14.0
1494	3,770	453	136	272	408	544	15.0
1594	4,070	489	147	294	441	588	16.5
1694	4,360	524	158	316	474	632	17.5
1794	4,650	559	168	336	504	672	19.0
1894	4,940	594	179	358	537	716	20.0
1994	5,230	628	189	378	567	756	21.0
2094	5,520	663	199	398	597	796	22.0
2194	5,810	697.5	210	420	630	840	22.0
2294	6,100	732.3	220	440	660	880	24.0
2394	6,390	767.1	231	462	693	924	26.0
2494	6,680	801.9	241	482	723	964	27.0
2594	6,970	836.8	252	504	756	1,008	28.0

FIGURE 21

MULTIPLE STEAM BOILER PIPING (WITH FORCED CONDENSATE RETURN)

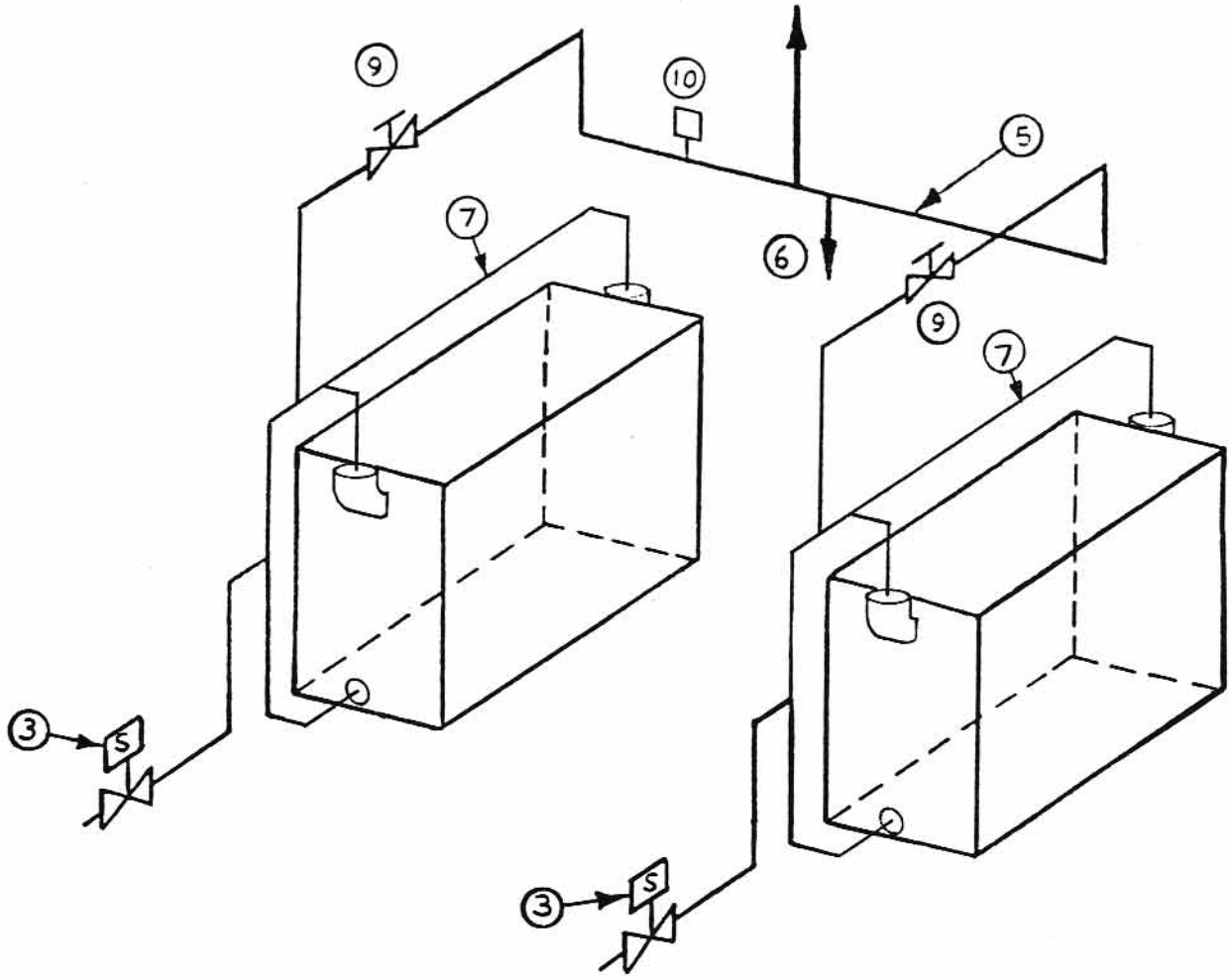


FIGURE 22

1. Install boiler feed pump control on each boiler with body mark at level indicated in boiler manual.
2. Use separate feed pumps for each boiler, or . . .

(3) Use single feed pump and separate solenoid valves for each boiler.

4. Install a combination float and thermostatic trap on each boiler to prevent flooding of one boiler while other boiler is firing. For 94 boiler, install trap in skim tapping (see pages 10 and 11). Connect traps to condensate receiver.

(5) Construct common supply drop header with pipe size at least same size as largest boiler header size.

(6) Install drain line at center of common supply drop header. Use a combination float and thermostatic trap to drain to condensate receiver.

(7) Install boiler piping as shown in boiler manual. For 94 boilers, see p. 15.

8. Use EMCS system with header mounted pressure control(s) to sequence boilers.

(9) Install stop valves per ASME code requirements and automatic steam valves when used. Use EMCS system to open automatic steam valve before firing burner.

(10) Steam pressure control.

JACKET INSTALLATION

Refer to jacket installation instructions packed in jacket carton.

Before jacket is installed:
- hydrostatically pressure test boiler
- plug all unused tappings
- attach supply and return piping

After jacket is erected, attach following parts to complete boiler assembly:

Cleanout doors—
1) Apply 1/8" continuous bead of rope adhesive in groove around doors.
2) Position 1/2" sealing rope in groove, overlapping ends at least 1".
3) Secure 8 mounting studs in tapped holes located around cleanout opening in front section.
4) Position door with hinge closest to centerline of front section over 4 studs. Hand tighten 4 wing studs to secure door to section.
5) Attach cleanout door hinge plate to installed door. Use two hinge pins.
6) Attach other door to hinge plate. Use two hinge pins.
7) Close second door. Hand tighten 4 wing studs to secure door to section.
8) Affix boiler nameplate to hinge plate. Use 2 drive screws.

Cleanout plates—
1) Thread two 1/2" nuts on round end of 1/2" × 4 1/4" stud. Lock nuts together.
2) Thread flat end of stud into tapped hole in one of the cleanout openings.
3) Remove nuts.
4) Repeat steps 1–3 for remaining 5 studs.
5) Apply 1/8" continuous bead of rope adhesive in groove around plates.
6) Postion 3/8" sealing rope in groove, overlapping ends at least 1".
7) Insert cleanout plate into each opening. Secure with hand-tightened wing nut.

Smoke collar—
1) Thread two 1/2" nuts on round end of 1/2" × 4 1/4" stud. Lock nuts together.
2) Thread flat end of stud into tapped hole inside flueway outlet in back section.
3) Remove nuts.
4) Repeat steps 1–3 for remaining 3 studs.
5) Apply 1/8" continuous bead of rope adhesive in groove around smoke collar.
6) Position 1/2" sealing rope in groove, overlapping ends at least 1".
7) Position smoke collar over studs. Breeching damper handle must point up. Tightly secure smoke collar to section using 1/2" nuts and washers.

Access shield and panel—
1) Insert access shield into opening in back section. Push against shield until it bottoms against stops.
2) Apply 1/8" continuous bead of rope adhesive in groove around access panel.
3) Position 1/2" sealing rope in groove, overlapping ends at least 1".
4) Secure four mounting studs in holes around opening in back section.
5) Position access panel over studs. Hand-tighten 4 studs to secure access panel.

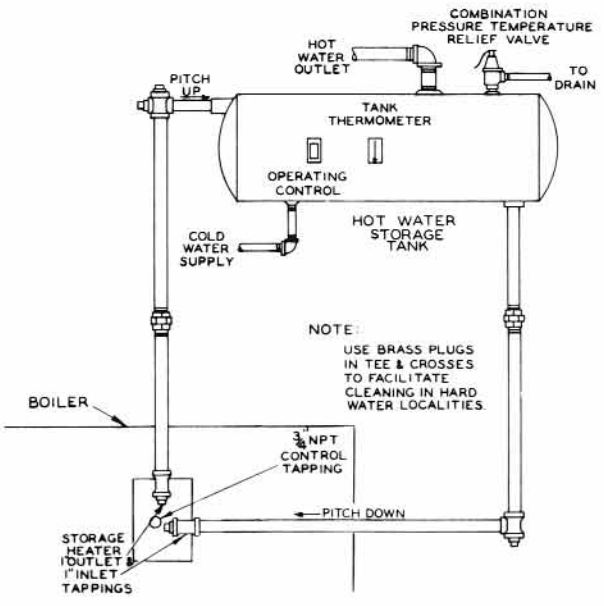
STORAGE HEATER HOOK-UP (when used)

1. Locate storage tank as high as possible above boiler.
2. Vertical type storage tank can be used if bottom of tank can be located above top of boiler.
3. To provide gravity circulation:
   a) Horizontal supply from heater to tank must pitch upward 1 inch for each 10 feet of piping.
   b) Horizontal return from tank to heater must pitch downward 1 inch for each 10 feet of piping.
4. Locate tank return piping above heater inlet.
5. Use as few elbows and pipe fittings as possible.
6. Multiple storage heaters—pipe as shown in multiple tankless heaters. See Figure 24.
7. In hard water areas, it is advisable to soften cold domestic supply water to heaters to prevent lime build-up.

STORAGE HEATER RATINGS*

Heater Number	180° Heater Capacity Gallons 40°–140°F Rise	212° Heater Capacity Gallons 40°–140°F Rise	Inlet and Outlet Tappings
92-K-ST	110 in 3 Hrs.	160 in 3 Hrs.	1"
Recommended Storage Tank	200–500 Gallons	250–500 Gallons	

*Weil-McLain Ratings



TYPICAL STORAGE HEATER INSTALLATION

SCHEMATIC STORAGE HEATER PIPING
FIGURE 23

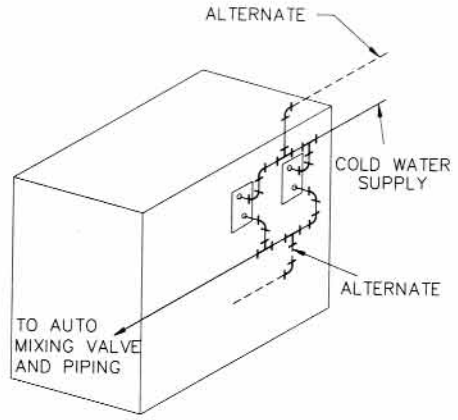
TANKLESS HEATER HOOK-UP (when used)

1. Size piping no smaller than the heater inlet and outlet.
2. Automatic mixing valve must be installed.
3. Flow regulating valve must be installed. Size according to intermittent draw of heater as shown in following table.
4. Operating control with a small adjustable differential scale is recommended. Install in temperature control tapping in heater plate.
5. Multiple tankless heaters (see Figure 24):
   a) Use a cold water supply header with individual risers to each heater.
   b) Hot water outlets must also be headered.
   c) Do not pipe multiple heaters in series.
   d) Header size, increase one pipe size for each additional heater.
6. In hard water areas, it is advisable to soften cold domestic supply water to heaters to prevent lime build-up.

DOMESTIC WATER HEATER CAPACITIES
TANKLESS HEATER RATINGS*

Heater Number	**Intermittent Draw GPM 100°F. Average Temperature Rise	***Continuous Draw GPM 100°F. Temperature Rise	Inlet and Outlet Tappings
92-K-34	9 GPM	11 GPM	3/4"

*Weil-McLain Ratings
**Gallons of Water per min. heated from 40° to 140°F. with 200°F. boiler water temp.
***Continuous Draw—no recovery period.



MULTIPLE TANKLESS HEATERS
FIGURE 24

Section VII: Installing Boiler Controls

WATER BOILER CONTROLS

WARNING Failure to properly install, pipe and wire boiler controls may result in severe damage to the boiler, building and personnel, and is not covered by boiler warranty.

1. Install furnished controls where shown in Control Tapping Table and Figure 12, pages 9 and 10.
2. Relief valve must be mounted vertically.

WARNING Relief valve discharge piping must be piped near floor close to floor drain to eliminate potential of severe burns. Do not pipe to any area where freezing could occur.

3. **Low water cut off for water boilers:**
   a) Must be installed on any water boiler if the boiler is located above radiation level.
   b) May be required on water boilers by certain state, local or territorial codes or insurance companies.

   If a low water cut-off is used on a water boiler, use a control designed especially for water installations. Install in tee in supply piping or as shown in Control Tapping Table, page 10.
4. Dual limit control settings:
   a) low—set according to design requirements.
   b) high—20° higher than low limit, 240° F. maximum.
5. Install optional controls per control manufacturer's instructions.

STEAM BOILER CONTROLS

WARNING Failure to properly install, pipe and wire boiler controls may result in severe damage to the boiler, building and personnel, and is not covered by boiler warranty.

1. Install furnished controls where shown in Control Tapping Table and Figure 12, pages 9–10.
2. Relief valve must be mounted vertically.

WARNING Pipe relief valve discharge through vertical piping to atmosphere. Install drain pan elbow to drain condensate. Pipe near floor close to floor drain.

Recommended Locations For Low Water Cutoff, Water Feeders and Pump Controllers When Used on Weil-McLain Steam Boilers.•

LOCATION NO. 1		LOCATION NO. 2	
Primary Water Level Control•	Casting Line Height Above Bottom of Gauge Glass (A)	First Back-Up Water Control•	Casting Line Height Above Bottom of Gauge Glass (B)
61, 63	1/4"	—	—
193, 93 & 94	2"	—	—
51-2* & 51-S-2	1" to 1 1/4"	—	—
61 & 63	1/2"	61 & 63	1/4"
193, 93 & 94	2"	193†, 93† & 94†	1/4"
193, 93 & 94	2"	61 & 63	1/4"
193‡, 93‡ & 94‡	2"	51-2* & 51-S-2	1/4"

• Other manufacturers controls providing similar function may be used provided they are properly located and are selected to handle the boiler evaporative capacity.

† Use low water cutoff function only. Pump controller function should only be used on "highest" control location.

‡ Use pump control function only. Back-up controller to provide low water cut-off function or low water cut-off and feeder function.

*Not recommended for use on 1694–2594 boilers. Feeder capacity on 51-2 is not high enough for the larger boilers.

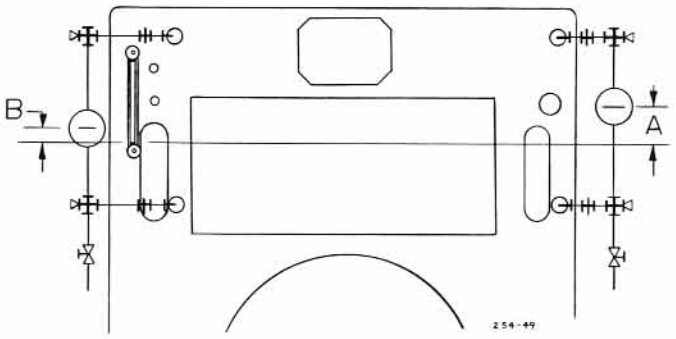
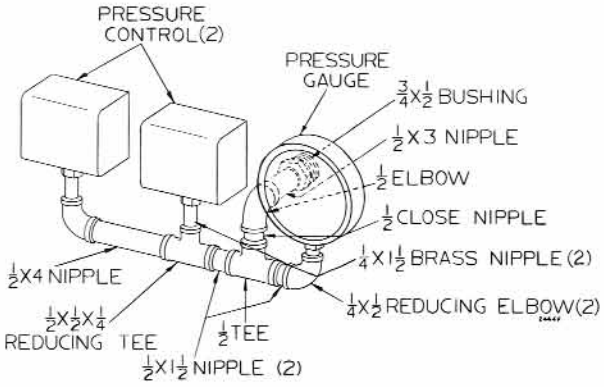


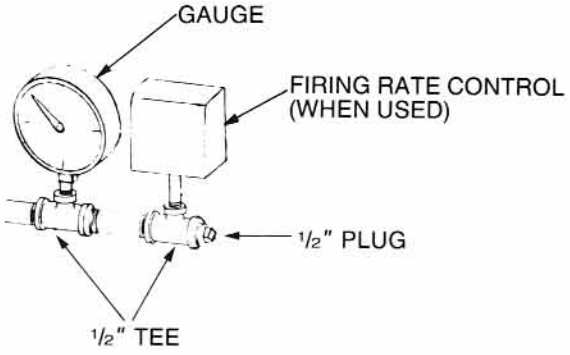
FIGURE 25

3. Install water level controls in tappings as shown in Figure 25.
   a) Install optional controls according to Control Tapping Table and Figure 25 using fittings (not furnished).
   b) If water level control to be used is not dimensionally diagrammed in Figure 25, locate cast-on-body mark on control, install according to manufacturer's instructions.
4. Install steam pressure operating and high limit controls and pressure gauge. See Figures 26 or 27.
5. Pressure limit control settings:
   a) low—per design requirements.
   b) high—at least 2 PSIG higher than low limit, 15 PSIG maximum.



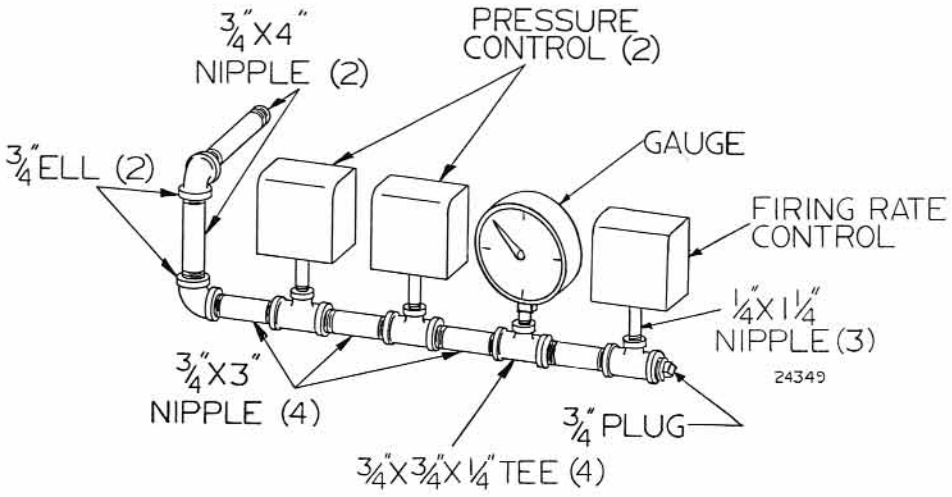
Note: Check local codes for manifold size and cleanout requirements.

894–2094
CONTROL SYPHON AND FITTINGS



FIRING RATE CONTROL PIPING

FIGURE 26



Note: Check local codes for manifold size and cleanout requirements.

2194–2594
CONTROL SYPHON AND FITTINGS
FIGURE 27

Section VIII: Breeching Erection and Burner Installation

BREECHING ERECTION

WARNING Seal venting system gas-tight and connect breeching with welded seams and joints to prevent leakage of combustion products into boiler room.

1. 894–2194 boilers—construct "stub" to attach breeching:
   a) Use steel breeching—16 ga. or heavier, 20" nom. diameter, minimum 6-inch length (so damper can open).
   b) Remove breeching collar flange from smoke collar.
   c) Insert or butt stub against counter flange so stub is square to flange. Stub must not extend past back edge of flange.
   d) Weld stub to flange gas-tight.

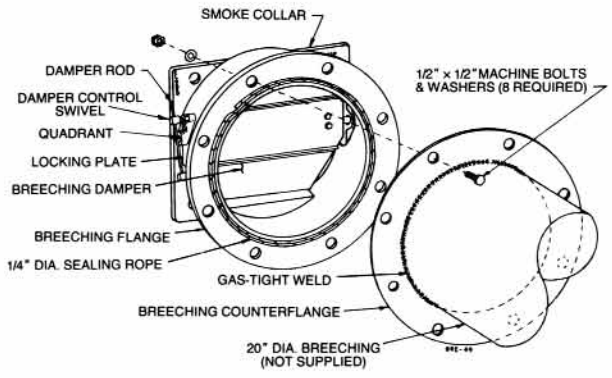


FIGURE 28

   e) Check that sealing rope is intact on smoke collar flange.
   f) Reassemble counter flange to smoke collar. Use 1/2" × 1 1/2" machine bolts and washers. Seal gas-tight.
   g) See page 5 to complete breeching.
2. 2294–2594 boilers:
   a) Counter flange comes with 12" male adapter attached to secure breeching to boiler.
   b) See page 5 to complete breeching.

BURNER INSTALLATION

(For H94 burners—install according to burner manufacturer's instructions.)

1. Unpack burner.
2. Apply 1/8" continuous bead of rope adhesive around blast tube. Position sealing rope to make gas-tight seal.
3. Mount burner into burner mounting plate.

CAUTION Maintain gas-tight seal between burner mounting flange and plate to prevent damage to air tube.

4. Level burner.
5. Secure with furnished mounting studs, washers, nuts, and clamps.
6. Keep burner information packet with boiler.

Section IX: Wiring

WARNING Electric shock hazard. Can cause severe injury or death. Disconnect power source before installing or servicing.

All wiring should be installed in compliance with the rules of the National Electrical Code ANSI/NFPA No. 70-1984 for installation in the U.S.A. or Candadian Electrical Code C22.2 Part 1 for Canadian installations, and any local, state, or insurance requirements or codes having jurisdiction.

1. Pre-wired control cabinet is furnished with standard burners.
2. Wiring diagram is found either affixed to panel door or in burner information packet.
3. Follow burner manual and wiring diagram for proper wiring of burner and boiler controls.
4. Use 14 gauge wire for:
   a) operating wiring
   b) safety circuit wiring
5. Where burner motor voltage differs from control voltage, supply proper voltage to each.
6. Use properly sized fused disconnect and conductors for control circuit and burner motor.

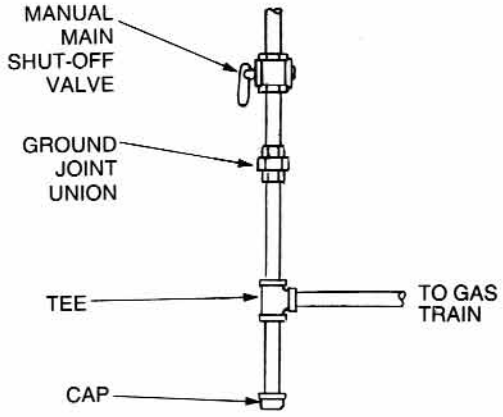
Section X: Fuel Line Piping

GAS PIPING

In sizing the gas piping, the following factors should be considered.

a) Diameter and length of the gas supply piping.
b) Number of fittings.
c) Maximum gas consumption (including any possible future expansion).
d) Allowable loss in gas pressure from the gas meter outlet to the boiler.

1. Minimum inlet natural gas pressure required at manual main shut-off gas valve—see Burner Installation and Service Manual and material list.
2. Follow good piping practices.
3. Pipe joint compound (pipe dope) must be resistant to the corrosive action of liquified petroleum gases and applied sparingly only to the male threads of pipe joints.
4. A drip leg must be installed at inlet of gas connection to boiler. Where local utility requires drip leg be extended to the floor, use an appropriate length of pipe between the cap and tee.
5. A ground joint union must be installed in the piping to provide for servicing (see Figure 29).
6. Piping must be supported by hangers, not by the burner or its accessories.



GAS SUPPLY PIPING
FIGURE 29

7. Purge all air from the supply piping.
8. All gas piping should be tested for leaks after installation—BUBBLE TEST.

FUEL OIL PIPING
(see burner manual for additional information needed to size oil piping)

DANGER To prevent oil flow in case of oil line breakage:
a) Use anti-syphon device when any part of tank is above burner level.
b) Use check valve in suction line on burner side of manual shut-off valve nearest tank when top of fuel tank is below burner level.

1. Two-pipe fuel oil piping system is required for all installations.
2. Supply line must enter tank from top, extending to within 4–6″ from bottom of tank. Return line should enter tank at different location from supply, and extend to within 4"–6" from bottom of tank.
3. Use oil filter sized for suction line capacity.

CAUTION Do not install filter close to outside wall or outside.

5. Use continuous copper tubing to reduce possible piping leaks and sealing when piping is buried.
6. Use flare type fittings, not compression type.

DANGER Fire hazard. DO NOT USE soldered fittings. No safe repair can be made.

7. Follow good piping practices.
8. Pipe joint compound (pipe dope) must be resistant to corrosive action of fuel oil. Apply sparingly only to male threads of pipe joints.
9. Supply and return oil piping should be sized to design conditions. See oil pump manufacturer's recommendations.
10. Auxiliary fuel oil pump is recommended when suction line exceeds 12 feet of lift.
11. Install swing joints to tighten as buried tank settles to prevent fuel line breakage.
12. Where iron pipe is required by local codes, make swing joints with nipples and elbows several inches long on both suction and return lines. Locate close to tank.
13. Install manual shut-off valve in suction line piping near burner and where piping enters building from outside tank.
14. Pitch suction line piping toward fuel tank.
15. Provide tee and plug at highest point in suction line to release air from suction line and aid in priming.

Section XI: Final Adjustments

FILLING WATER BOILERS

1. Close manual air vents and drain cocks.
2. Fill to correct system pressure. Correct pressure will vary with each application.
3. a) Starting on the lowest floor, open air vents one at a time until water squirts out. Close vent.
   b) Repeat with remaining vents.
4. Refill boiler to correct pressure.

FILLING STEAM BOILERS

1. Do not fill (except for leakage tests) until boiler is ready to be fired.
2. Fill to normal waterline, halfway up gauge glass.
3. Boiler water pH 7.0 to 8.5 is recommended.
4. Make burner breeching and damper adjustment, then follow skimming procedure for all newly installed steam boilers.

BURNER AND BREECHING DAMPER ADJUSTMENT (See Figure 30)

CAUTION Final burner adjustments must be made using combustion test equipment to assure proper operation. DO NOT FIRE BOILER WITHOUT WATER OR SECTIONS WILL OVERHEAT.

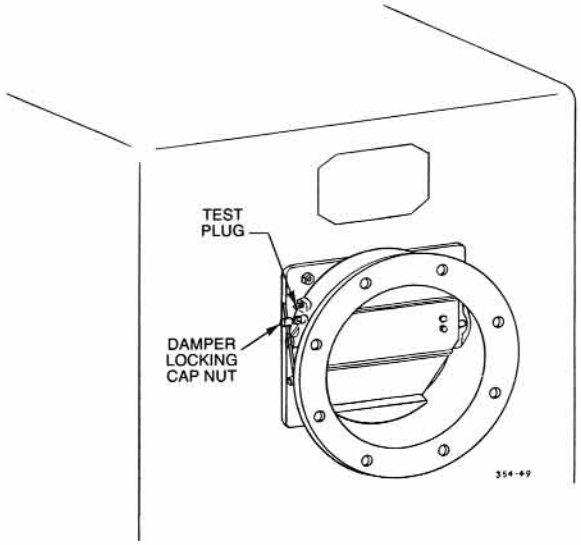
1. Lock open breeching damper.
2. Refer to burner manual for start-up and service.
3. Let burner advance to high fire. Heat boiler to design conditions.
4. Using combustion test equipment, adjust burner for:
   a) 12% (±½%) CO_2 for No. 2 fuel oil, 0 smoke.
   b) H-94 burners, see burner manual for CO_2 and smoke levels.
   c) 9–10% CO_2 natural gas, CO in flue gas not to exceed 300 ppm (0.03%).
5. Adjust breeching damper to assure 0.1″ W.C. positive pressure at test opening on draft hood collar.
6. Secure damper.
7. Plug test opening with ⅛″ brass plug.
8. Adjust barometric draft control to design conditions, when used.
9. Recheck following step #4 above. Readjust as necessary.

SKIMMING STEAM BOILERS

CAUTION Clean all newly installed steam boilers to remove oil. Failure to properly clean can result in violent fluctuations of water level, water passing into steam mains, or high maintenance costs on strainers, traps and vents. Do not use PETROLEUM based products in this boiler!

NOTICE Skim boiler only. DO NOT clean old piping. Leaks can occur.

1. Provide 4" piping from boiler skim tapping to floor drain.
2. Adjust waterline to midpoint of skim piping.
3. Fire burner to maintain a temperature below steaming rate during skimming process.
4. Feed in water to maintain water level. Cycle burner to prevent rise in steam pressure.
5. Continue skimming until discharge is clear. This may take several hours.
6. Drain boiler at washout tappings. While boiler is warm but NOT HOT, refill boiler and allow to drain, flushing sediment from bottom of boiler sections.
7. Remove skim piping. Plug skim tapping.
8. Close drain cock. Fill with fresh water to waterline. Start burner and steam for 15 minutes to remove dissolved gases. Stop burner.
9. Check traps and air vents for proper operation.



BREECHING DAMPER FIGURE 30

WATER TREATMENT

Never use petroleum based stop-leak compounds. Water seal deterioration will occur, resulting in leakage between sections.

Continual make-up water will reduce boiler life. Minerals can build up in the sections, reducing heat transfer, overheating the cast iron, and causing section failure.

For unusually hard water areas or low pH conditions (less than 7.0) consult local water treatment company.

Freeze protection (water boilers only, when used):

Use antifreeze especially made for hydronic systems. Inhibited propylene glycol is recommended. DO NOT use undiluted or automotive type antifreeze.

50% solution provides maximum protection to about −30°F.

Local codes may require a back-flow preventer or actual disconnect from city water supply.

Determine quantity according to system water content. Boiler water content is listed on page 25. Percent solution will affect sizing of heat distributing units, circulator and expansion tank.

Follow antifreeze manufacturer's instructions.

CHECKING GAS-TIGHT SEAL

WARNING BOILER MUST BE SEALED GAS TIGHT for proper combustion efficiency and safety to building occupants!

1. Remove jacket side and top panels.
2. Shut off breeching damper.
3. Start burner. Observe all sealing points and chalk mark any not gas-tight.
4. Use silicone sealant to seal marked areas.
5. Replace jacket panels.

Ratings

Boiler Unit Number Steam or Water	I-B-R Burner Capacity▼			Gross I-B-R Output BTU/Hr.† ▼▼	Net I-B-R Ratings‡			Net Sq. Ft. Water ****	Boiler H.P.	Net Firebox Volume Cu. Ft.	Stack Gas Volume CFM ***** Light Oil & Gas	Positive Pressure In Firebox In. W.C. Light Oil & Gas □	Draft Loss Through Boiler In. W.C. Light Oil & Gas	I-B-R Chimney Size Vent Dia. Inches	Water Boiler Content (Gals.)
	** Light Oil GPH	*** Heavy Oil GPH ▼▼	Gas MBH ►		Steam Sq. Ft. ▼▼	Steam BTU/Hr. ☆ MBH ▼▼	Water BTU/Hr. ☆ MBH ▼▼								
▲ 894*F•	17.6	16.6	2540	2,028,000	6,563	1,575	1,763	11,753	60.6	45.40	1088	0.275	.175	14	274.3
▲ 994*F•	20.0	19.0	2887	2,320,000	7,504	1,801	2,017	13,447	69.3	51.48	1242	0.315	.215	14	302.0
▲1094*F•	22.5	21.5	3247	2,612,000	8,450	2,028	2,271	15,140	78.0	57.56	1397	0.355	.255	16	329.8
▲1194*F•	25.0	24.0	3608	2,904,000	9,396	2,255	2,525	16,834	86.7	63.64	1555	0.395	.295	16	357.5
▲1294*F•	27.5	26.0	3969	3,190,000	10,321	2,477	2,774	18,494	95.3	69.72	1710	0.435	.335	16	385.2
▲1394*F•	30.0	28.5	4330	3,480,000	11,258	2,702	3,026	20,174	104.0	75.80	1866	0.475	.375	18	413.0
▲1494*F•	32.5	31.0	4691	3,770,000	12,196	2,927	3,278	21,854	112.6	81.88	2020	0.515	.415	18	440.7
▲1594*F•	35.0	33.0	5052	4,070,000	13,167	3,160	3,539	23,594	121.6	87.96	2175	0.555	.455	18	468.4
▲1694*F•	37.5	35.5	5412	4,360,000	14,104	3,385	3,791	25,274	130.2	94.04	2325	0.585	.485	18	496.2
▲1794*F•	40.0	38.0	5773	4,650,000	15,042	3,610	4,043	26,954	138.9	100.12	2480	0.625	.525	20	523.9
▲1894*F•	42.5	40.5	6134	4,940,000	15,979	3,835	4,296	28,640	147.6	106.20	2640	0.665	.565	20	551.6
▲1994*F•	45.0	42.5	6495	5,230,000	16,921	4,061	4,548	30,320	156.2	112.28	2795	0.705	.605	20	579.4
▲2094*F•	47.5	45.0	6856	5,520,000	17,858	4,286	4,800	32,000	164.9	118.36	2945	0.750	.650	20	607.1
▲2194*F•	50.0	47.4	7216	5,810,000	18,796	4,511	5,052	33,680	173.6	124.44	3120	0.850	.750	20	634.8
▲2294*F•	53.0	49.8	7577	6,100,000	19,733	4,736	5,304	35,360	182.2	130.52	3255	0.950	.850	22	662.6
▲2394*F•	55.0	52.2	7938	6,390,000	20,671	4,961	5,557	37,047	190.9	136.60	3410	1.050	.950	22	690.3
▲2494*F•	58.0	54.6	8299	6,680,000	21,608	5,186	5,809	38,727	199.6	142.68	3565	1.150	1.050	22	718.0
▲2594*F•	60.0	57.0	8660	6,970,000	22,546	5,411	6,061	40,407	208.2	148.76	3730	1.250	1.150	22	745.8

▲ Substitute "BL-" for light oil, "BGL-" for gas light oil, "BG-" for gas. Add prefix "A" for factory-assembled No. 94—894–2194 only (example: ABL).
Use "P" in place of "B" for fire-tested package unit (example: PL-894).
Substitute "H-" for boiler without burner (example: H-894).

* Substitute "S" for steam, "W" for water.

● For T-intermediate section(s) and tankless heater(s), add suffix "(number required) TIH"; for T-intermediate section(s) with cover plate(s) only, add suffix "(number required) TIP";

▼ Burner input based on maximum of 2,000 ft. altitude—for higher altitudes consult Weil-McLain Sales Office/Agent.

▼▼ Heavy oil burner ratings are Weil-McLain certified for 2194–2594.

** No. 2 oil—Commercial Standard Spec. CS75-56. Heat value = 140,000 BTU/G.

*** No. 4 or No. 5 oil—Commercial Standard Spec CS75-56. Heat value = 150,000 BTU/G.

► Consult Weil-McLain Sales Office/Agent for gas pressure required.

† Gross I-B-R ratings have been determined under the I-B-R provision governing forced draft boiler-burner units.

‡ Net I-B-R ratings are based on net installed radiation of sufficient quantity for the requirements of the building and nothing need be added for normal piping and pick-up. Water ratings are based on a piping and pick-up allowance of 1.15. Steam ratings on an allowance of 1.288.

☆ An additional allowance should be made for gravity hot water systems or for unusual piping and pick-up loads. Consult Weil-McLain Sales Office/Agent.

**** Based on average water temperature of 170°F. in heat distributing units.

***** Stack gas volume at outlet temperature.

□ With 0.10" W.C. positive pressure at smoke collar.

NOTE: Water boilers tested for 50 PSIG, ASME water working pressure. Available upon special request at 80 P.S.I. working pressure. Steam boilers tested for 15 PSIG, ASME steam working pressure.

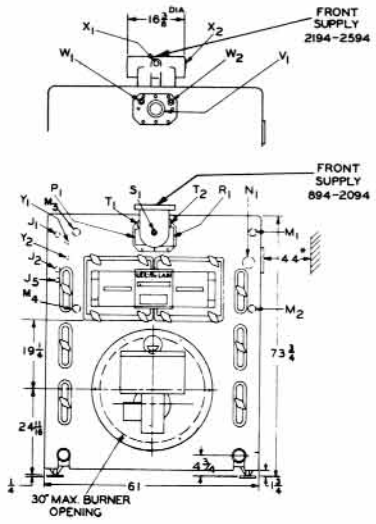
. . . and Data

Boiler No.	WATER* Supply Outlet No. & Size	WATER* Return Inlet Size	STEAM* Supply Outlet No. & Size	STEAM* Return Inlet Size	A Steam Only	B Water	B Steam	C	D Water	D Steam	E	J Steam Only	L	W
894	1-6"	6"	1-8"	6"	—	7 11/16	7 11/16	45	—	—	76	—	52 1/2	51
994	1-6"	6"	2-8"	6"	77 5/8	7 11/16	7 11/16	51	—	—	76	16 3/8	58 1/2	57
1094	1-6"	6"	2-8"	6"	83 5/8	7 11/16	7 11/16	57	—	—	76	16 3/8	64 1/2	63
1194	1-6"	6"	2-8"	6"	89 5/8	7 11/16	7 11/16	63	—	—	76	16 3/8	70 1/2	69
1294	1-6"	6"	2-8"	6"	95 5/8	7 11/16	7 11/16	69	—	—	76	16 3/8	76 1/2	75
1394	1-8"	8"	2-8"	6"	101 5/8	8 3/8	7 11/16	75	—	—	76	16 3/8	82 1/2	81
1494	1-8"	8"	2-8"	6"	107 5/8	8 3/8	7 11/16	81	—	—	76	16 3/8	88 1/2	87
1594	1-8"	8"	2-8"	6"	113 5/8	8 3/8	7 11/16	87	—	—	76	16 3/8	94 1/2	93
1694	1-8"	8"	2-8"	6"	119 5/8	8 3/8	7 11/16	93	—	—	76	16 3/8	100 1/2	99
1794	1-8"	8"	2-8"	6"	125 5/8	8 3/8	7 11/16	99	—	—	76	16 3/8	106 1/2	105
1894	1-8"	8"	2-8"	6"	131 5/8	8 3/8	7 11/16	105	—	—	76	16 3/8	112 1/2	111
1994	1-8"	8"	2-8"	6"	137 5/8	8 3/8	7 11/16	111	—	—	76	16 3/8	118 1/2	117
2094	1-8"	8"	2-8"	6"	143 5/8	8 3/8	7 11/16	117	—	—	76	16 3/8	124 1/2	123
2194	1-10"	10"	2-10"	6"	72	8 3/8	7 11/16	123	17 1/4	29 1/4	82 1/2	—	130 1/2	129
2294	1-10"	10"	2-10"	6"	78	8 3/8	7 11/16	129	17 1/4	29 1/4	82 1/2	—	136 1/2	135
2394	1-10"	10"	2-10"	6"	84	8 3/8	7 11/16	135	17 1/4	29 1/4	82 1/2	—	142 1/2	141
2494	1-10"	10"	2-10"	6"	90	8 3/8	7 11/16	141	17 1/4	29 1/4	82 1/2	—	148 1/2	147
2594	1-10"	10"	2-10"	6"	96	8 3/8	7 11/16	147	17 1/4	29 1/4	82 1/2	—	154 1/2	153

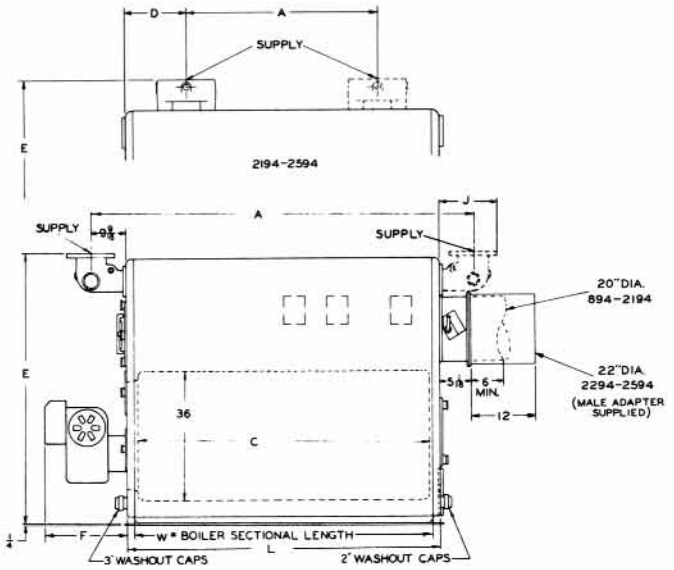
*All 6" supply and return outlets are tapped, all 8" and 10" supply outlets are flanged.

NO. 94 BURNER LENGTH CHART
DIMENSION "F"

Boiler Size	Power-Flame	Gordon-Piatt
894	44	34
994	44	34
1094	44	34
1194	44	34
1294	44	34
1394	44	34
1494	50	37
1594	50	37
1694	50	37
1794	50	37
1894	50	37
1994	50	36
2094	50	36
2194	50	36
2294	50	36
2394	50	36
2494	50	36
2594	50	36

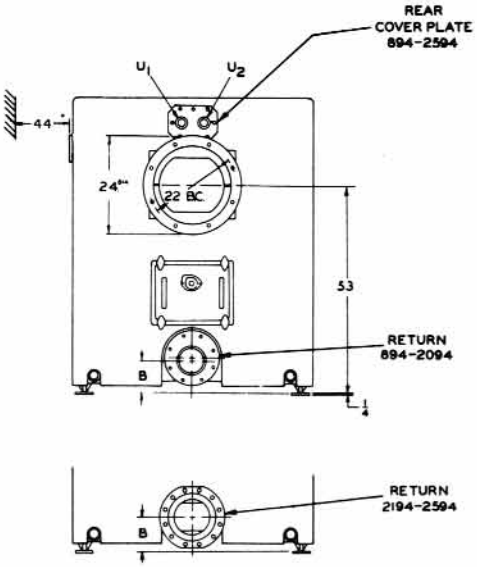


FRONT

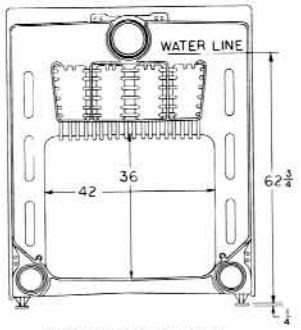


SIDE

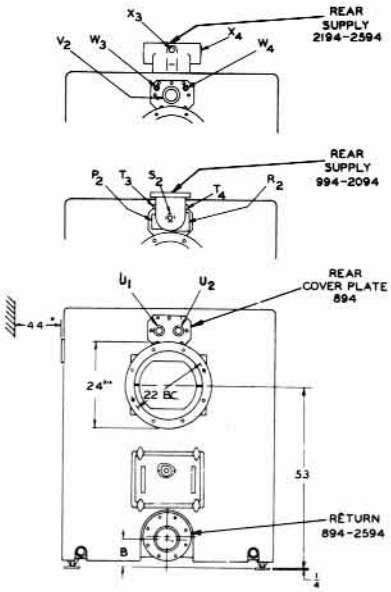
*Minimum clearance for tankless heater.



BACK
(WATER)



INTERMEDIATE



BACK
(STEAM)

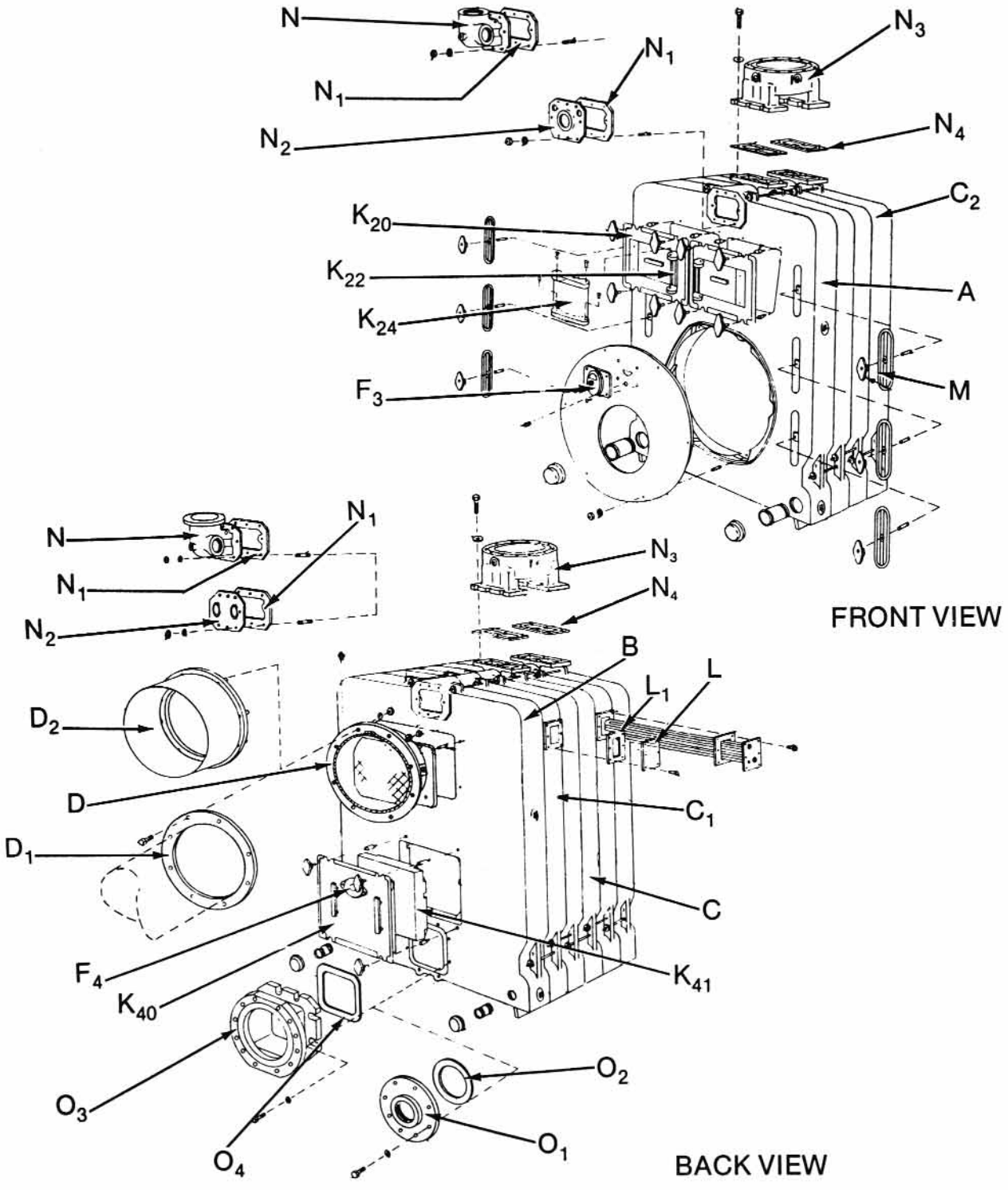

N
N1
N2
N3
N4
C2
K20
K22
K24
F3
A
M
FRONT VIEW
B
L
L1
D2
D
D1
C1
C
F4
K40
K41
O3
O4
O2
O1
BACK VIEW

Fig. No.	Description	Casting Number	Sales Reference Number
A	Front Section "FR"	9517	10B129
B	Back Section Water & Steam w/8" Return Flange	9518	10B130
B	Back Section Water Only for 10" Return Flange Adapter	95218	10B131
C	Reg. Intermediate Section "I"	9515	10B132
C_1	"TI" Intermediate Section	9516	10B133
C_2	Supply Intermediate Section "SI"	9519	10B134
	6" Dia. Bottom Elastomer Seal (2 per joint)	—	11B161
	9" Dia. Top Elastomer Seal (1 per joint)	—	11B160
	5/8" × 10" Draw Rod w/o Nut (4 per joint)	—	10B877
	5/8" × 11" Draw Rod w/o Nut (4 per joint)	—	10B878
	5/8" Nut (2 per draw rod)	—	10B951
	5/8" Washer (1 per draw rod)	—	10B957
	Flue Brush	—	11B145
	Flue Brush Rod, 44"	—	11B147
	Flue Brush Rod, 62"	—	11B148
	Flue Brush Spacer, 48"	—	11B150
	Flue Brush Handle, Flexible Wire	—	11B149
	1/8" Dia. Sealing Wick (3' for front observation port, 1' for relief plate, 1' for damper locking plate)—TP500 Type FNS 125	—	10B986
	3/8" Dia. Sealing Rope (6' for rear access shield, 2' for rear observation port, 2' for front observation port, 12' for drafthood counter flange, 3' per cleanout plate)—TP1000 MD375	—	10B987
	1/2" Dia. Sealing Rope (9' per burner plate, 6' for draft hood collar, 6' for rear access door, 6'for cleanout door)—TP500 Type HD-500	—	10B985
	5/8" Dia. Sealing Rope (30' per joint)—TP500 Type XL-625-60-5	—	10B988
	Construction Adhesive for Sealing Rope (11 oz. tube)	—	11B143
	Silicone Sealant (RTV 108 or equivalent) (approximately 0.,47 oz. per joint)	—	11B141
K_{40}	Back Access Door Ass'y, $470 (includes door liner, handle and rope)	—	10B405
	Refractory Liner for Back Access Door	—	11B157
	Wing Nut Ass'y. w/3/8" × 1 1/4" Stud	9256	10B404
	Mounting Stud	92P112A	10B927
K_{41}	Refractory Shield for Back Access Opening	—	10B438
M	Cleanout Plate	9264	10B357
	Wing Nut Cleanout w/1/2" Tapping	9256	10B356
	Stud 1/2" × 4 1/4" DAP-104A	—	10B928
K_{20}	Cleanout Door Ass'y. #474 (includes door, hinge, hinge plate, handle, liner and accessories)	—	10B406
	Wing Nut Ass'y. w/3/8" × 1 1/4" Stud	9256	10B404
	Mounting Stud	92P112A	10B927
K_{22}	Hinge for Cleanout Door	9254	10B355
K_{24}	Hinge Plate for Cleanout Door	9253	10B354
	Liner for Cleanout Door	—	10B984
L	Cover Plate for Heater Opening (Rectangular)	—	10B841
L_1	Gasket for Heater Cover Plate (Rectangular)	—	10B970
F_3	Front Observation Port Ass'y. #462 (includes bottom, intermediate and top observation port plates, spring, rope and sight glass)	—	10B402
	Front Sight Glass	—	11B126
F_4	Back Observation Port Ass'y. (includes frame, rope, gasket, plugs and sight glass)	—	10B391
	Back Sight Glass	—	11B127
	Washer for Back Sight Glass	—	10B975
D	Flue Collar Ass'y., 20" (includes flue collar w/flange, damper, damper quadrant, locking plate, swivel, bracket, counterflange, and rope	—	10B401
	Quadrant for Flue Collar	8474	10B347
	Damper Blade for Flue Collar	—	10B793
	Damper Locking Plate	—	10B962
	Stud 1/2" × 4 1/4" DAP 104A	—	10B928
D_1	Counter Flange for 20" Flue	—	10B828
D_2	Flue Adapter, 22" Welded Steel	—	10B829
O_1	Return Flange Reducer, 8" to 6"	086	10B285
O_2	Gasket for Return Flange Reducer, Round	—	10B972
O_3	Return Flange Adapter, 10"	9410	10B361
O_4	Gasket for Return Flange Adapter, Rectangular	—	10B979
N	6" Supply Elbow Tapped, Water Only	9246	10B350
N	8" Supply Elbow, Water Only Flanged	9248W	10B352
N	8" Supply Elbow, Steam Only Flanged	92481-S	10B353
N_1	Gasket for Supply Outlet (2 req'd)	—	10B971
	Stud 5/8" × 3" 92P151A	—	10B929
N_2	Cover Plate for Supply Outlet, 2"	9440	10B362
	Cover Plate for Supply Outlet, 4"	92140	10B349
N_3	Top Supply Outlet, 10" Flanged	92410	10B351
N_4	Gasket for Top Supply (2 req'd. per fitting), 10"	—	10B980

WATER TRIM AND CONTROL COMPONENTS

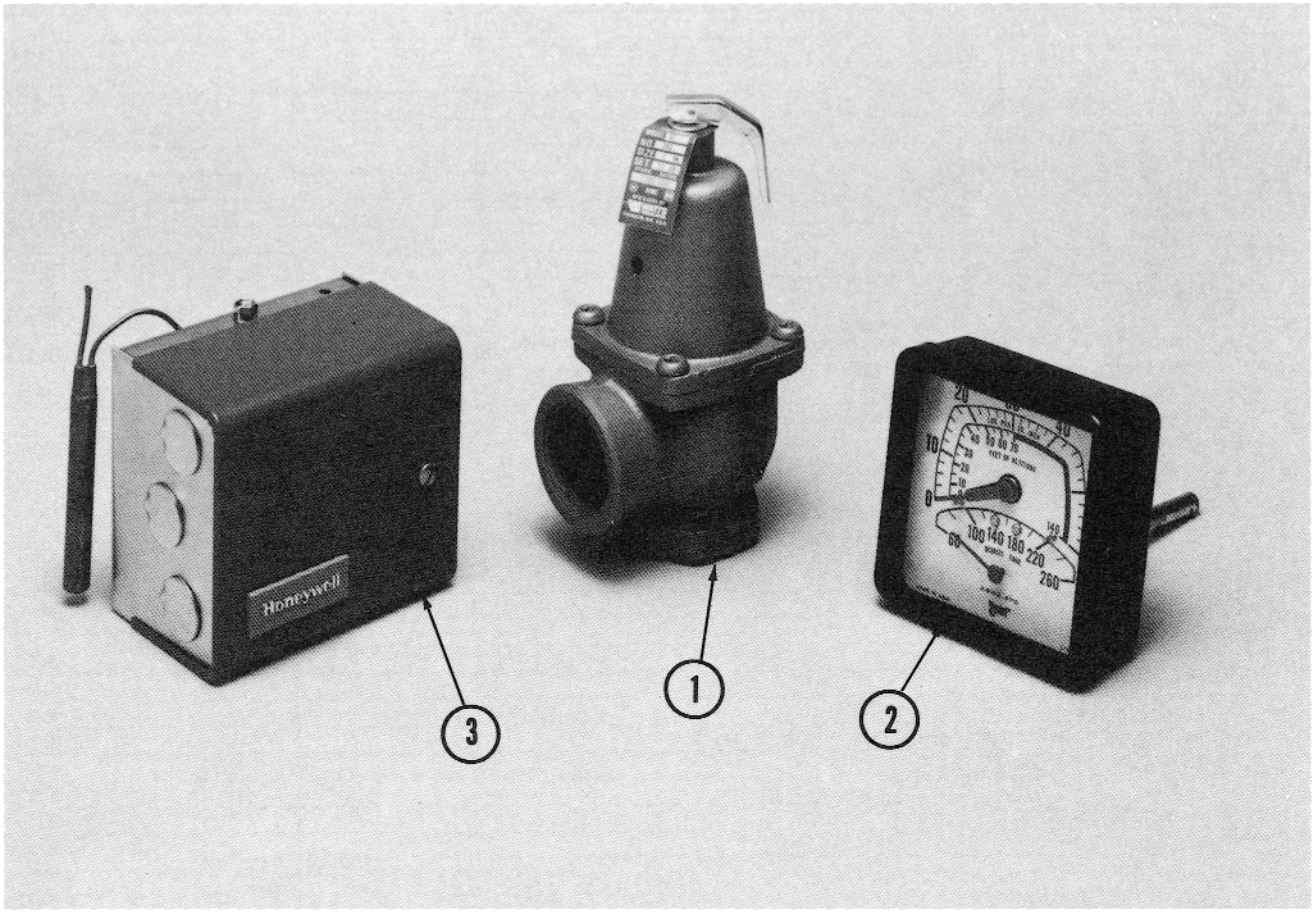


Fig. No.	Description	Manufacturer	Manufacturer's Part No.	Sales Reference No.	BOILER SIZE																
					8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
1	ASME Pressure Relief Valve, 1" inlet × 1¼" side outlet, Brass, 30 PSIG	Watts	740	10C202														1	1	1		
1	ASME Pressure Relief Valve, 1¼" inlet × 1½" side outlet, Brass, 30 PSIG	Watts	740	10C203	1																1	1
1	ASME Pressure Relief Valve 1½" inlet by 2" side outlet, Brass, 30 PSIG	Watts	740	10C204		1	1										2					
1	ASME Pressure Relief Valve, Set to Relieve at 30 PSIG, 2" inlet by 2½" Side outlet, Brass	Watts	740	10C205				1	1	1	1	1	1	1	1	1		1	1	1	1	1
2	Combination Pressure-Temperature Altitude gauge. 0–60 PSIG, 60–260°F. 0–138 ft., Back Connection, ½"N.P.T.	Marshalltown	13HJ	10C033	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
3	Combination High Limit-Low Limit Control with High Limit: 130 to 240°F. Low Limit: 115 to 240°F.	Honeywell	L4081A-1007 with well	10C064	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1

STEAM TRIM AND CONTROL COMPONENTS

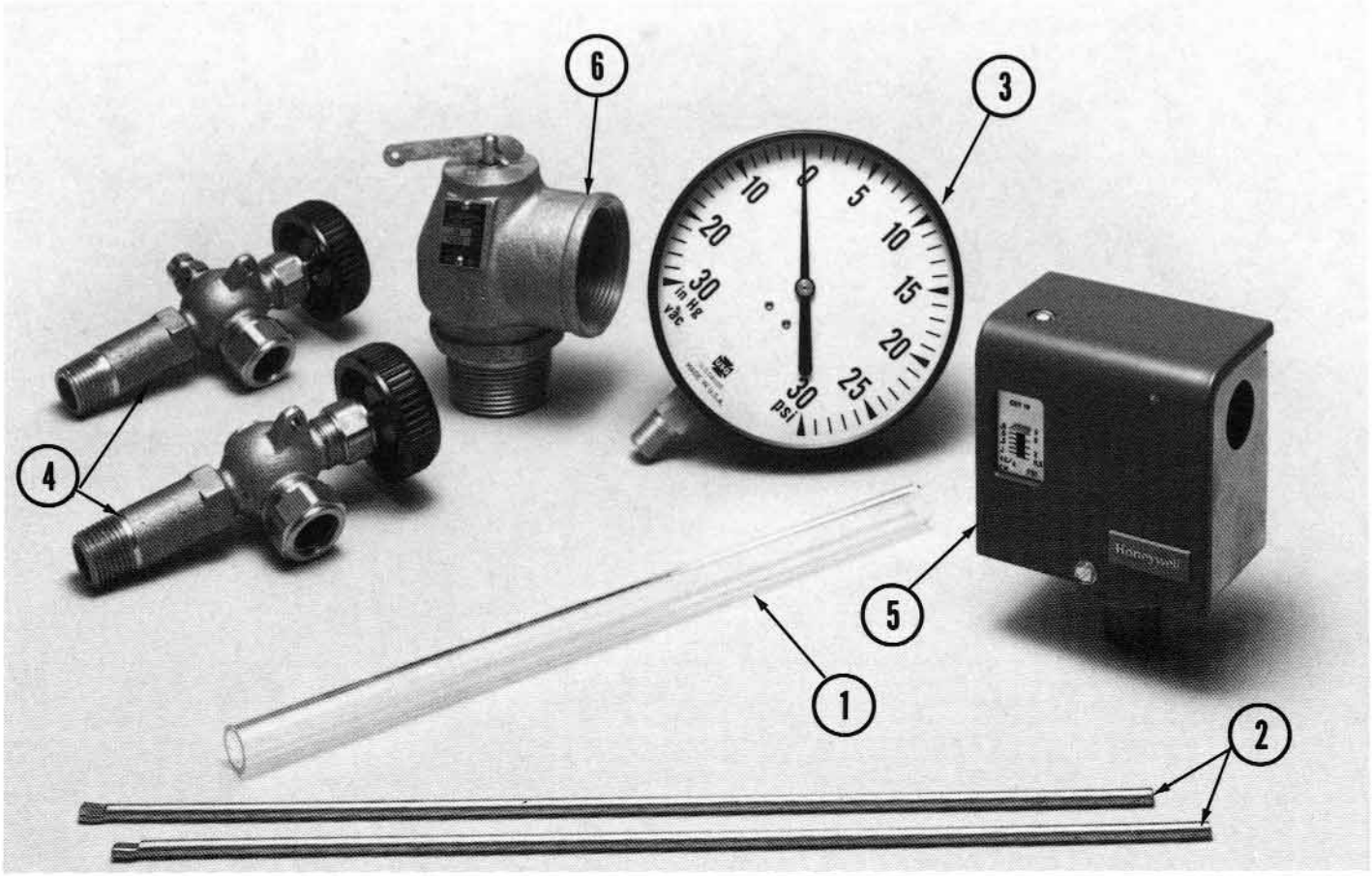


Fig. No.	Description	Manufacturer	Manufacturer's Part No.	Sales Reference No.	BOILER SIZE																
					8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
1	Gage Glass 5/8" dia. × 10 5/8" long	Weil-McLain		10C334	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
2	Gage Glass Guards, 3/16" dia. × 12 1/2" long	Weil-McLain		10C292	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
3	Combination Pressure–Vacuum Gauge, 0–30 PSIG, 0–30" Hg., 4 1/2" Dial., Bottom Connection, 1/4" N.P.T.	Marshalltown	16P	10C035	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
4■	Water Gage Glass Cocks, set 1/2" N.P.T., Male Inlet	Conbraco	21-205-03	10C037	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
4■	Water Gage Glass Cocks, set 1/2" N.P.T., Male Inlet	United Brass Works	905 & 946	10C037	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
5■	High Pressure Limit, 0 to 15 PSIG Adjustable, subtractive differential 2 to 8 PSIG. Open on High Pressure Switch Action.	Johnson Controls	P47AA-1	10C048	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
5■	High Pressure Limit, Operating Range: 0 to 9 PSIG, Differential: 0 to 5 PSIG.	Honeywell	PA404A	10C048	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
6	Steam Safety Valve 1 1/4" inlet, set to relieve at 15 PSIG, side outlet, 1200 lbs./hr. Capacity	Conbraco	13-213-08	10C209			1	1														
6	Steam Safety Valve 1 1/2" inlet, set to relieve at 15 PSIG, side outlet, 1900 lbs./hr. Capacity	Conbraco	13-214-08	10C210			1	1	2	2	1	1				1						
6	Steam Safety Valve 2" inlet, set to relieve at 15 PSIG, side outlet, 2500 lbs./hr. Capacity	Conbraco	12-205-08	10C211	1	1					1	1	2	2	2		1	1				
6	Steam Safety Valve 2 1/2" inlet, set to relieve at 15 PSIG, side outlet, 3529 lbs./hr. Capacity	Conbraco	12-206-08	10C212												1	1	1	2	2	2	2

■ Alternate Components

WEIL-McLAIN

Weil-McLain
500 Blaine Street
Michigan City, IN 46360-2388